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AMERICAN MACHINIST

SEPTEMBER 16, 1943

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Plant Layout in Three Dimensions—Page 87

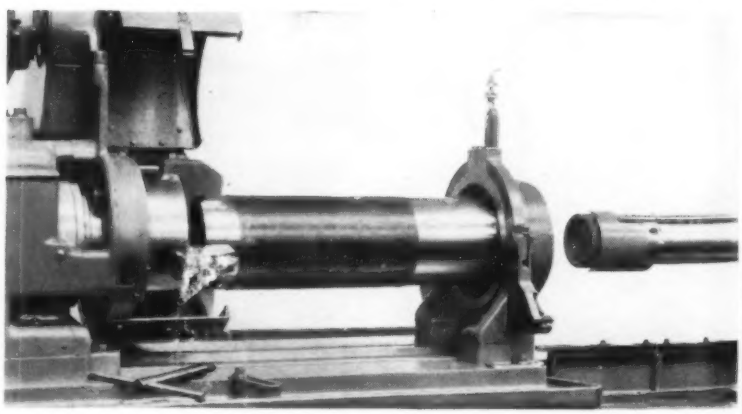
PRECISION

takes the bounce out of Rough Landings

Setting a giant war bird down without a bounce calls for a skillful job of ing . . . calls for precision manufac- of all landing gear components, too. grinding many of the parts on d Automatic Grinders, aircraft ufacturers get extreme accuracy in component. Accuracy that en- the landing gear to cushion the k of the roughest landing.

owever, this is but one of the many Heald ision grinding and boring applications. In aircraft industry alone, you will find dreds of Healds boring, grinding, turning, ving, forming, milling, and facing aero- e components to the closest tolerances at mass production speeds.

Heald Engineers will gladly help you with your precision grinding and boring jobs. Ask for their services, today.



Shown above is a Heald No. 74 Extended Bridge Internal grinding big aircraft strut cylinders. A bore 6" I.D. x 31½" long is ground in these struts. Strut is held at one end by a four-jaw chuck attached to the workhead and at the other end by a steadyrest, both workhead and steadyrest being mounted on the extended bridge.

THE HEALD MACHINE CO., Worcester, Mass., U.S.A.

For More Precision Faster, bring your problems to Heald

American Machinist

September 16, 1943

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AMERICAN MACHINIST —chips

Last Call . . . *Distribution of reprints of the poem "Question for Americans" (May 27 issue of AM) has so far amounted to about 9,000. However, requests have about tapered off and we still have some 1,200 left. Somebody probably can use these to good advantage, so they are hereby offered "first come first served" while the supply lasts. No charge, of course.*

o

Intelligent Advertising . . . Off and on in this column we have reminded you of the constant efforts being made by our advertisers to bring you information that will be truly helpful in your daily work. Here is a specific example of what we mean:

An advertising agency just wrote us, on behalf of their client, asking the editors of *American Machinist* about the Metal-Working outlook for the next six months or so. They wanted to know some of the problems you men would likely be facing, and how *American Machinist* was preparing to help you editorially.

This information was requested so that the coming advertising for that company could be tied in to your needs as closely as possible. In other words, it was an intelligent approach to the problem of taking useful facts from where they are to where they are needed.

This extra effort to give you what your suppliers believe you need is producing results. The advertising pages are increasingly helpful. Look through this issue . . . look through *any* issue . . . and see for yourself.

o

Bed-fellows . . . *Swiping out of the paper a yarn credited to one Sir Ronald Storrs, onetime associate of Lawrence of Arabia, we quote as follows: "The Italians hate the Germans in Italy so bitterly they refuse to talk German to them. The Germans, for the same reason, refuse to talk Italian. Result—they speak to each other in English."*

o

Another Odessey . . . Ben Brosheer, now operating out of Chicago as Associate Editor of *American Machinist* but not long ago cavorting around the East Coast, turned up recently at headquarters on something of a mission.

Ben is gathering, for your advance information, data for an AM "Materials Section" on cast copper-base alloys. This should prove extremely useful to you men who are buying and machining such parts.

In collecting his data, Ben is enjoying "Open Sesame" to some of the most closely-guarded war plants this side of Mars. That editors of *American Machinist* have this entree is an indication of how important the authorities consider the efforts of technical journals in furthering the war effort. And it means that you keep getting the very latest inside dope that can be released on production techniques.

o

Do Thou Take This Man? . . . *Sad to relate, bridegrooms certainly* will *be taken—and how—if the possible black market in wedding rings develops. Yeah . . . wedding rings, of* all *things. Jewelers, who are supplied by one manufacturing branch of our big Metal-Working family, wag their heads and say that double-ring ceremonies on top of curtailed production is making life tough for the ethical gents in the trade. Many retailers are having trouble carrying a full range of sizes, and it is feared that "fly-by-night" operators might make and sell base-metal rings with only a thin coating of gold.*

Oh me . . . what next? Is nothing *sacred?*

o

Worry, Worry . . . Lives there a man with soul so dead who never yet has gone to bed with a problem on his mind . . . and spent half the night, half asleep, worrying about it? There are few things worse than the mental torture of trying to do some heavy thinking when the old brain isn't up to it. It is remarkable, too, how many ideas seem swell in the wee small hours, and then are revealed as not so hot or downright silly in the cold light of morning and complete consciousness.

Going through such a session a few nights ago, we finally reached for a book and grimly started to try and read ourselves to sleep. The book happened to be one of a new series by Hervey Allen, marathon author of *Anthony Adverse.* This particular volume is titled *The Forest and the Fort,* and deals with the adventures of one Salathiel Albine on the Indian frontier in early colonial days.

At the very end of the book, the hero, as it so happened, was also sorely troubled by nightmares and worry. Finally, come the dawn, he made this observation:

"Lord, what trouble a man's mind can get him into at night! The only way to see the future is to march into it and find out."

That struck us as being a very timely phrasing of the old truth that tomorrow's difficulties never turn out quite as bad as they seem today. Some postwar worriers might find it a good idea to do more planning and less fretting . . . to march into the future, eyes open, and find out what lies ahead.

o

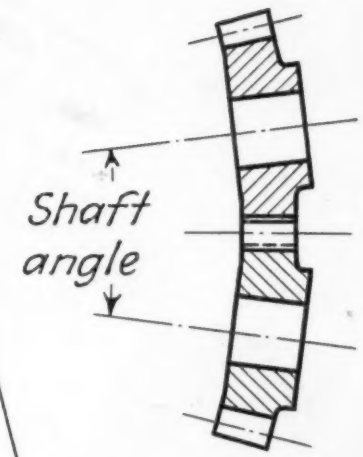
"Tools" No. 4 . . . *Pictured below is the fourth in our series of special sections designed to speed the training of wartime shop personnel. It tells the story of man's most versatile tool, the engine lathe, and gives the beginner basic information about the machine's operation. Quantities of reprints are available—as are those of the preceding sections on simple tools, drilling and milling. Some 40,000 of these sections are now in the field helping production executives solve the man-power problem. All sections may be obtained—as we have previously advised—at 10c per copy, slightly less in lots of 500 or more.*

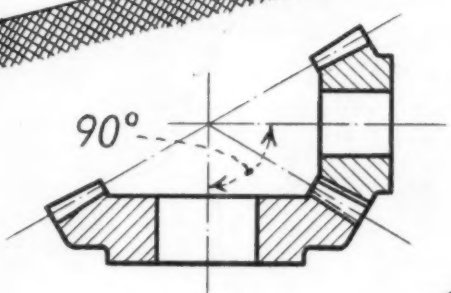
MEMO

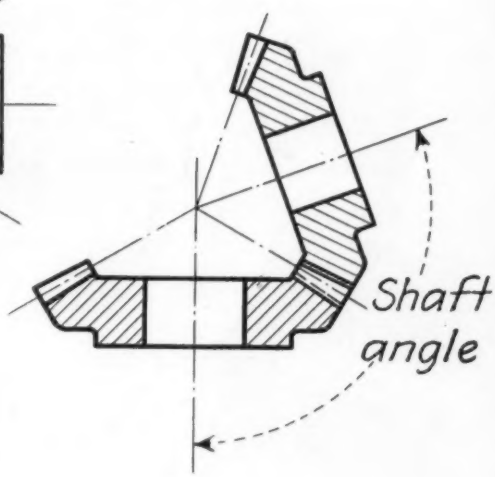
Don't Forget— Bevel Gears Operate at ANY Shaft Angle

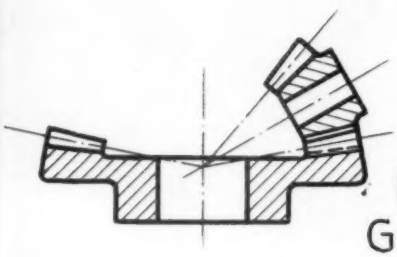
Too often this important fact is overlooked — forgotten by designers who believe that bevels work only at right angles. **Remember**— whenever you want to transmit power or motion "around a corner"— no matter what angle—a pair of bevel gears can be made for the job. Straight, Zerol, or spiral, Gleason-cut bevels provide smooth, reliable, long-life operation.

For over 75 years, the Gleason Works has been a specialist in "turning the corners." May we help you now with your angular drives?









Internal Bevel
Gear and Pinion

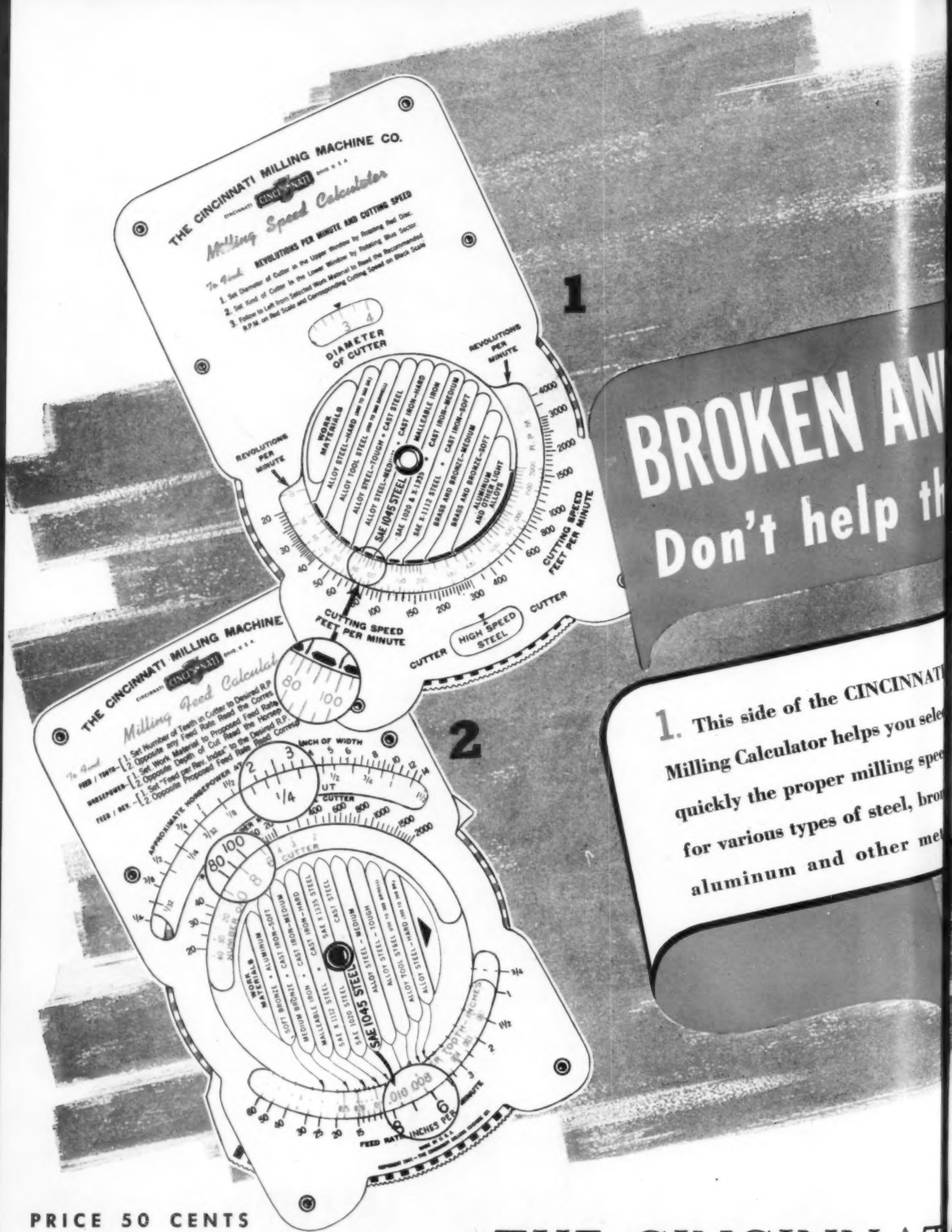
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

ARMY E NAVY



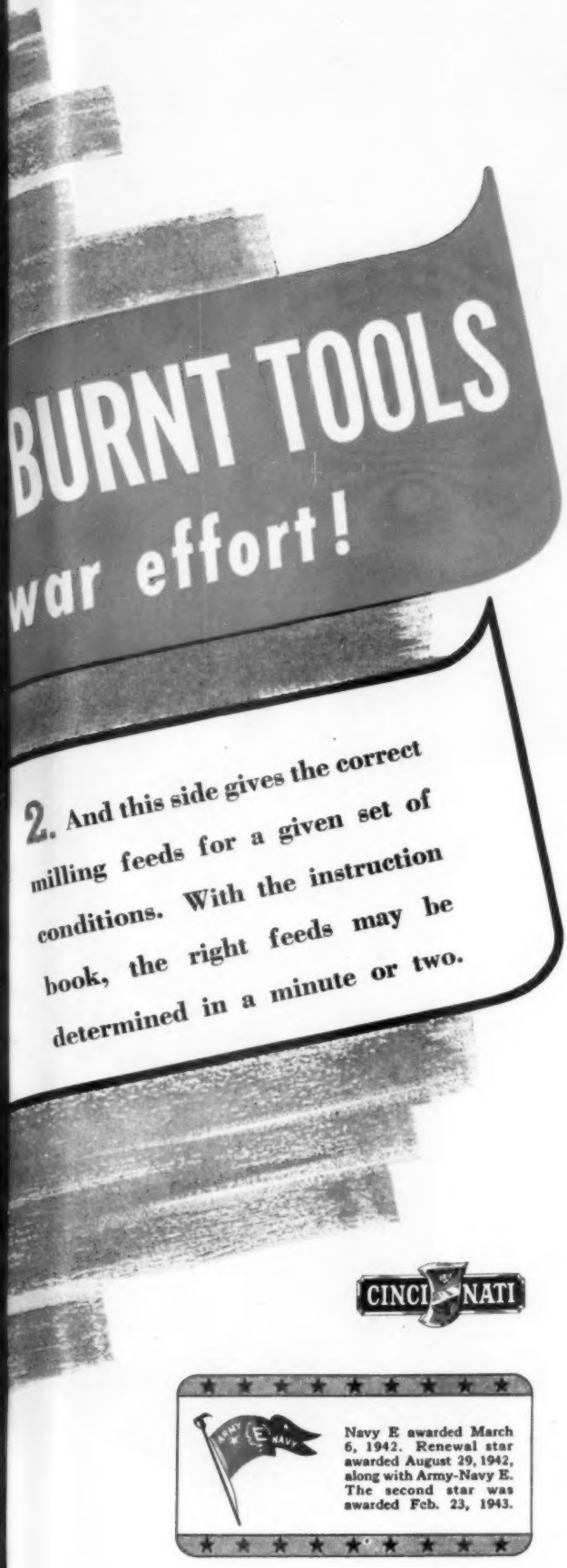
BROKEN AN
Don't help th

1. This side of the CINCINNATI Milling Calculator helps you selec quickly the proper milling spee for various types of steel, bro aluminum and other me

PRICE 50 CENTS

THE CINCINNATI MIL

MILLING MACHIN


BURNT TOOLS
war effort!
2. And this side gives the correct milling feeds for a given set of conditions. With the instruction book, the right feeds may be determined in a minute or two.

Knowing the right feeds and speeds for a given set of conditions has many advantages. You'll get better production because you won't change cutters so often. Less power will be used and better finishes obtained because your cutters will stay sharp longer. Fewer expensive cutters will be broken or burnt. You'll get more pieces per grind because there will be less regrindings. And above all, you'll be helping in the movement for the conservation of tools, which are vital weapons of production. ¶ To help curb the mounting costs of broken and burnt cutters, CINCINNATI Milling offers the Speed and Feed Calculator illustrated on the opposite page. This calculator takes a lot of the guesswork out of many milling operations. With it, operators confidently maintain maximum production. The calculator was developed by the engineers here at Milling Headquarters who have had many years' experience in building CINCINNATI Milling Machines. The cost of the calculator, together with instruction book, is 50 cents. Help keep 'em cutting by sending for your calculator today.

CINCINNATI

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES

A SHADOW OF

In inspection operations there is no way of gaging the consequences of doubt . . . but there's one sure way of gaging *beyond a shadow of a doubt!*

That method is with the use of **Jones & Lamson Optical Comparators,** projection machines for measuring and comparing objects by means of a magnified shadow.

> They measure angles in degrees and minutes; lead or spacing; height or depth . . . They photograph the enlarged shadow, without the need of a dark-room . . . They compare objects with a master outline . . . They permit rapid inspection and measurement of the many forms that are difficult or even impossible to inspect by direct gaging.

Any man or woman with a few minutes of instruction can operate this machine with speed and precision — a matter of particular importance in these days of manpower shortage.

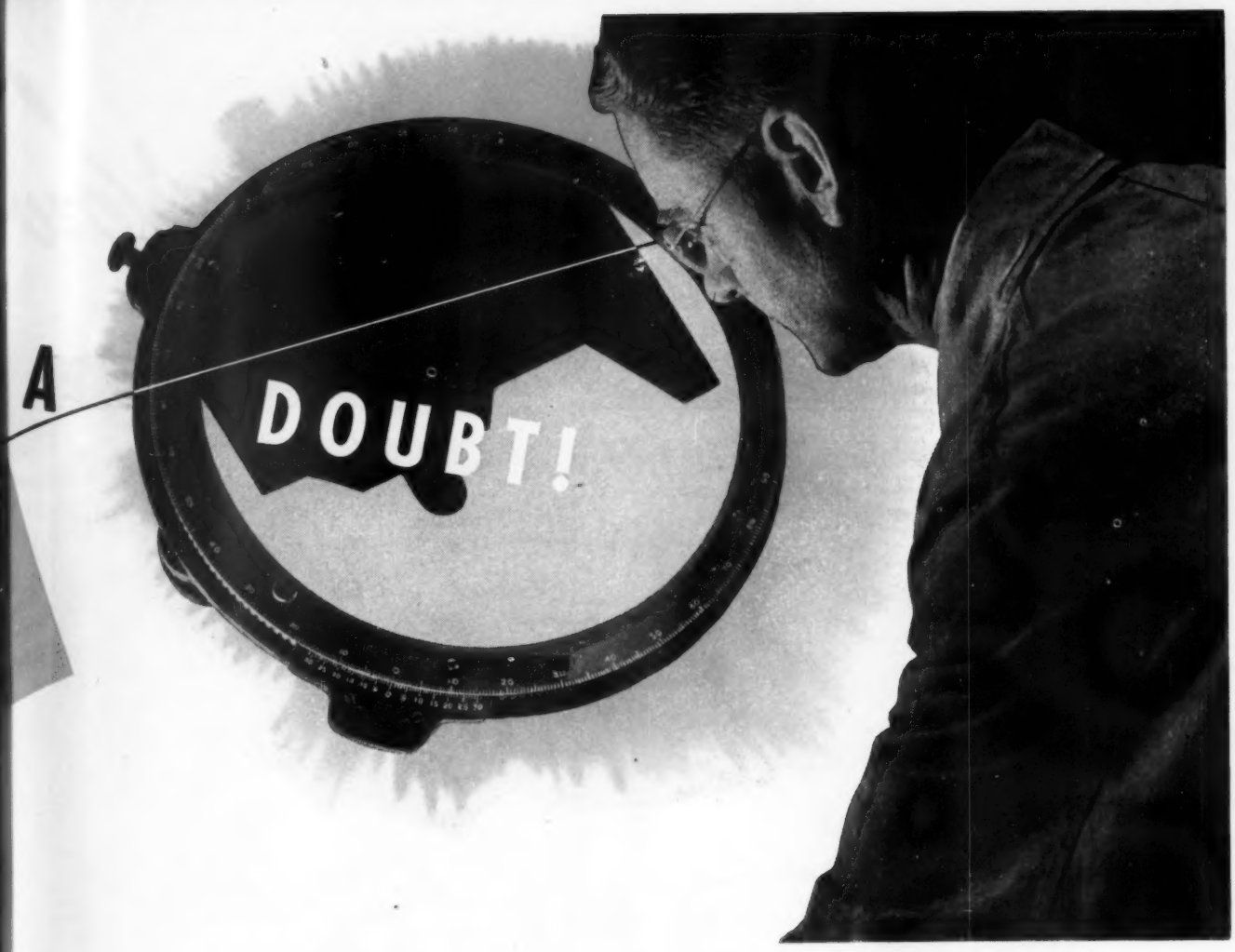
There's an experienced Jones & Lamson Inspection Engineer near you. Call, write or wire for this service to Jones & Lamson Machine Company, Springfield, Vermont.

For rapid, economical inspection . . .
BEYOND A SHADOW OF A DOUBT!

●

Advantages of Jones & Lamson Optical Comparators

1. All readings are direct—requiring no computations . . . **2.** Machine operation can be learned in minutes. . . **3.** One of the fastest inspection methods known. . . **4.** Permits study of tool wear and hardening distortion. . . **5.** Permits taking advantage of full allowable tolerances. . . **6.** Enlarged shadow can be studied by several persons at same time. . . **7.** Enlarged shadow can be photographed.

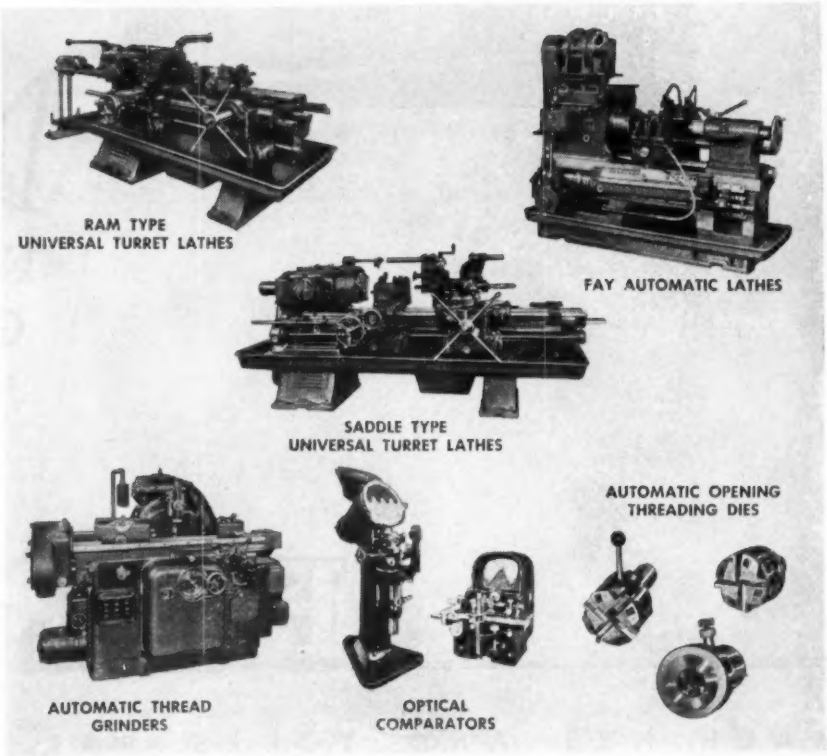


JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

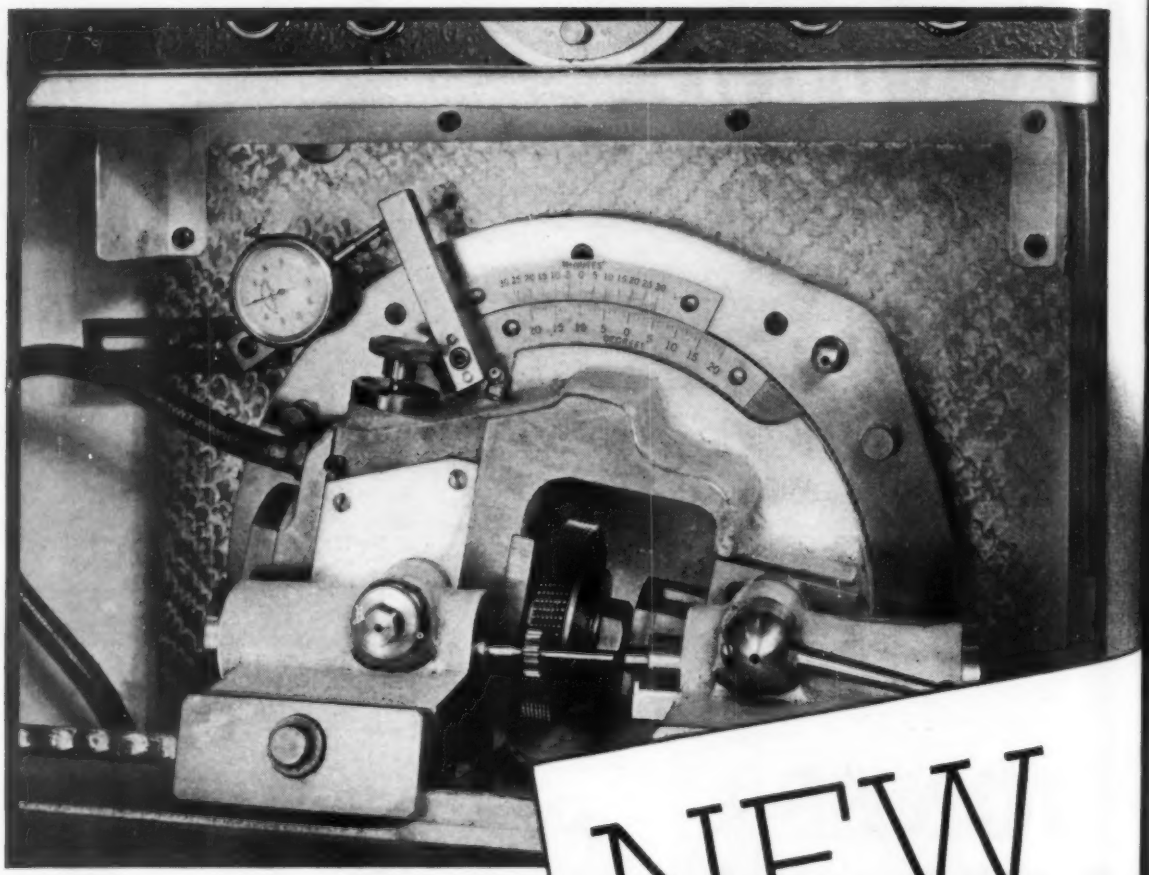
OPTICAL COMPARATORS

Manufacturers of:
Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

PROFIT-PRODUCING MACHINE TOOLS



... and Now



NEW

No. 4 Fellows Fine-Pitch Gear Shaving Machine

for Work up to 4 Inches diameter.

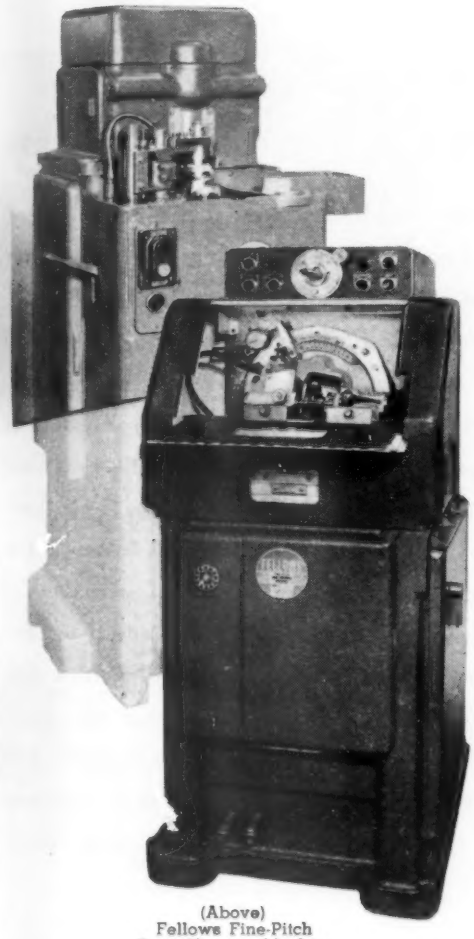
FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

FELLOWS PRECISION

Finishing . . .

OF SMALL, FINE-PITCH GEARS



(Above)
Fellows Fine-Pitch
Gear Shaving Machine

This new No. 4 Fellows Fine-Pitch Gear Shaving Machine is a highly satisfactory running mate to the Fellows Fine-Pitch Gear Shaper. It places the advantages of gear shaving at the disposal of manufacturers of fine-pitch gears, and possesses the following outstanding features:

MAXIMUM RIGIDITY
SIMPLICITY OF OPERATION
HIGH-SPEED OUTPUT
MINIMUM FLOOR SPACE

This machine is provided with complete push-button control making it extremely easy to set up and operate. It is also of extremely simple design, thus not requiring the attention of an experienced mechanic.

For more complete details, write: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Bldg., Detroit, Mich., or 640 West Town Office Bldg., Chicago, Ill.

Method

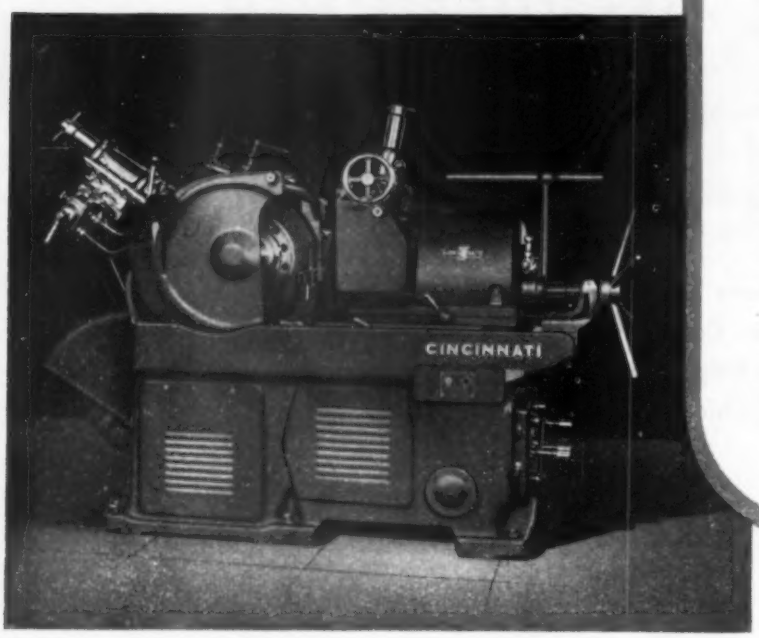
. . . . FROM BLANK TO FINISHED GEAR

PROPERLY GROUND BLADES AND CENTERS KEEP UP PRODUCTION

Save high speed steel

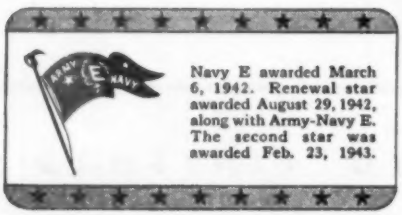
CINCINNATI

Illustrated below is the CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete specifications. Copy will be sent on request. Write today!



How to Recondition Blades and Centers — the Grinding Weapons of Production

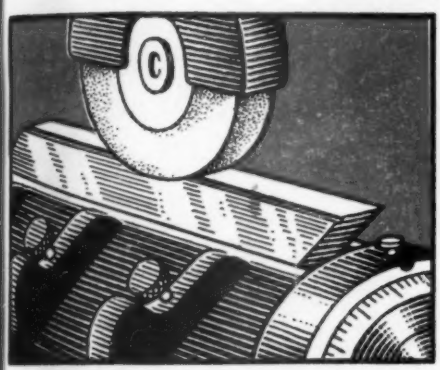
Consumable tools are not necessarily cutters. Centers for centertype grinders and blades for centerless grinders fall in the same classification. Many are made of high speed steel or sintered carbide, both critical materials, and their conservation is as important to the war effort as are the cutters on a milling machine. ¶ It's not difficult to grind blades and centers. All that's required is that you use care and follow a few fundamental principles. The engineers here at Grinding Headquarters will be glad to give you more detailed information and work with you on any grinding problem you may have. ¶ CINCINNATI manufactures a complete line of centertype and centerless grinding machines. Sweet's Catalog File gives brief description.

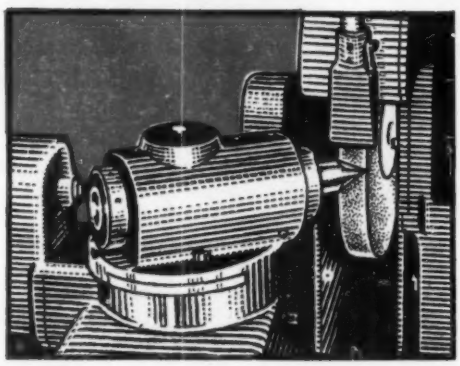


Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded Feb. 23, 1943.

CINCINNATI GR

CENTER TYPE GRINDING MACHINES





Illustrated above is the front view of a CINCINNATI 12" Hydraulic Universal Grinding Machine. Specification catalog G-486 gives complete information. Copy is yours for the asking. Write today!

BLADES. Since sintered carbide and high speed steel blades have remarkable wearing qualities, naturally they are resistant to grinding wheels, and must be ground very carefully. During regrinding the wheel becomes dull quickly, and dull wheels check the blade. With the proper precautions, however, a blade can be reground to its original accuracy. Use the correct wheel for blade material; take light cuts (.0005" for h. s. s. and .0002" for the carbides); dress the wheel often; when grinding blades on a surface grinder, flood with coolant. If you use a cutter grinder, be sure to *grind dry*.

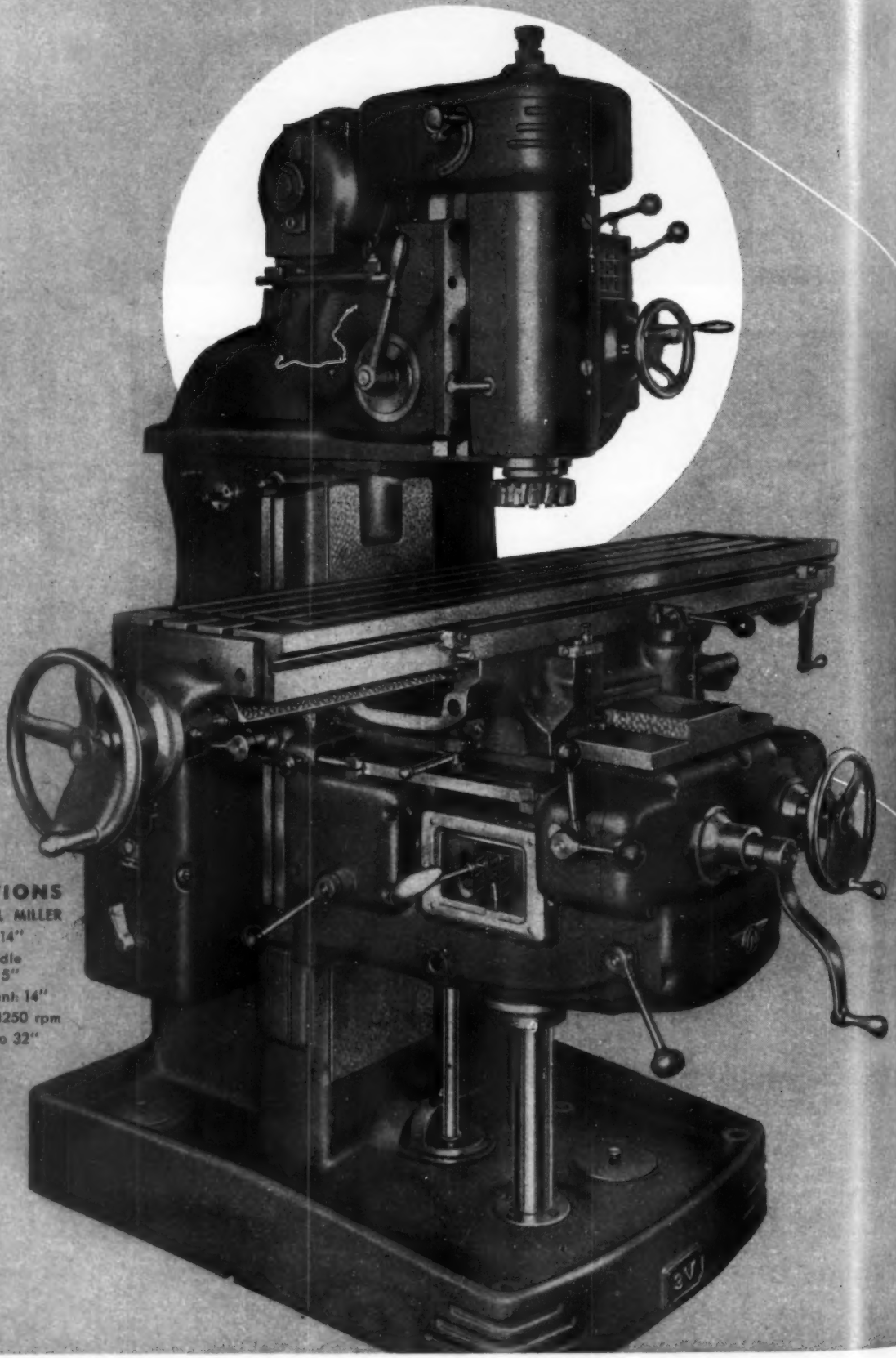
CENTERS. Worn centers can readily be reground to their original accuracy. High speed steel points may be reground on a centertype grinder with the aid of a center grinding fixture. Use a soft wheel, even though it means changing the wheel already on the machine. Be sure to flood with coolant. Sintered carbide centers may be reground on a cutter grinder using wheels recommended for the type of material. In either case, take *very light cuts* (.0002"). These precautions will prevent "checking" and give your centers many more productive hours.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Adjustable Ram and S

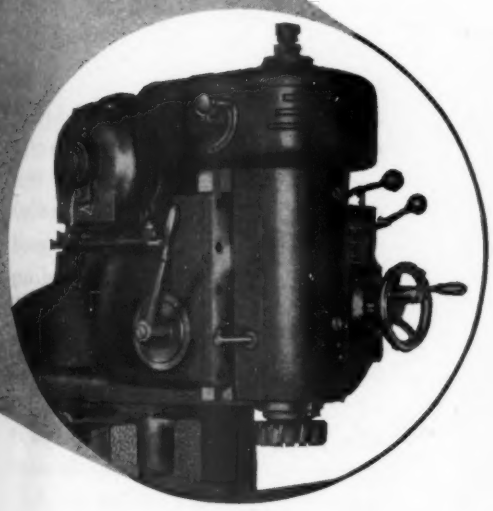


SPECIFICATIONS
No. 3V VERTICAL MILLER
Table: 64" x 14"
Vertical Spindle Adjustment: 5"
Throat Adjustment: 14"
18 Speeds: 25 to 1250 rpm
18 Feeds: 3/8" to 32"

Spindle Assembly Increases Your Work Range

ON VAN NORMAN 3V VERTICAL MILLERS

Noteworthy of the many important features incorporated in the Van Norman 3V Miller is the adjustable vertical spindle, mounted on a sliding ram. This sliding ram permits the throat distance to be varied so that the spindle can be more closely coupled to the column . . . which means maximum rigidity that insures greater accuracy. The variable throat distance also increases the range of set-ups and work that can be handled on this machine.



Easy to Reach, Quick-Acting Controls Speed Output

Conveniently located quick change speed levers, mounted on the ram, provide 18 speeds from 25 to 1250 rpm. Vertical adjustment of the heavy spindle is quickly made with the large hand wheel. 4 position dial indicator stop for step milling can be mounted on the front of the ram unit. Heavy sliding ram is easily positioned by means of crank on left side of column, and is solidly locked by cam-type gib clamps. In addition, the front and rear directional controls of power feeds, rapid traverse for table, knee and saddle provide ease of operation and help to increase output.

Van Norman Milling Machines

ARMY E NAVY

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.

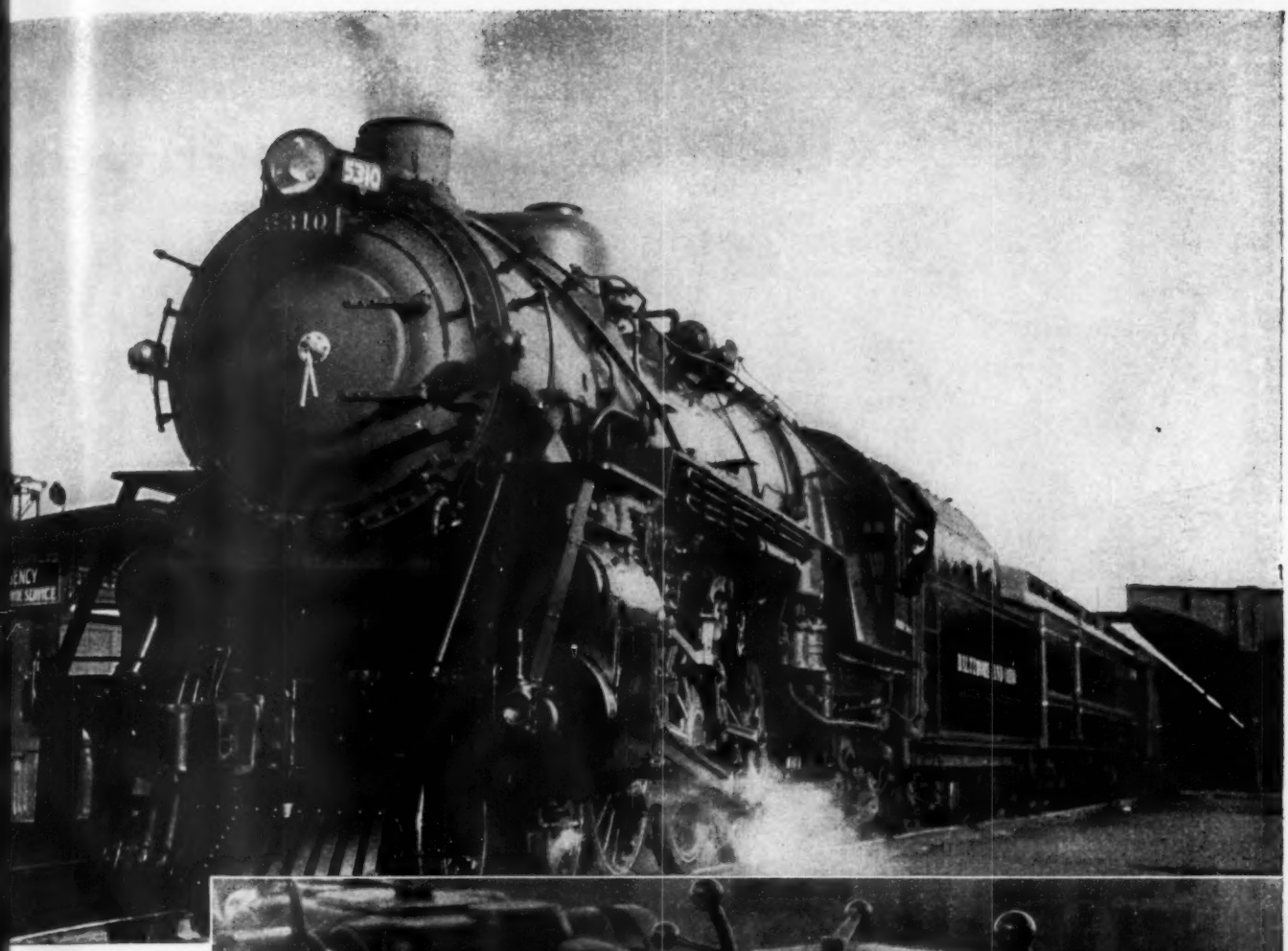
Landis Threads are Helping Keep Our Trains Rolling

In war as in peace American railroads are relying on Landis accuracy in threading staybolts and other vital threaded parts of locomotives and rail equipment. Keeping troops and supplies moving in addition to civilian transportation means continuous wear on rolling stock so performance of all parts is of vital importance. It is significant that locomotive manufacturers use Landis threading machines, die heads and chasers for their threading needs.

Landmaco Threading Machines are used exclusively in many railroad shops throughout the country for threading radial crown bolts, staybolts, and boiler studs. The outstanding design of the LANDMACO Machine, together with the inherent qualities—accuracy and economy—of the Landis long life Tangential Chaser which it employs, assures the lowest possible thread-cutting cost.

LANDIS

THREADING MACHINES



Write for Bulletin "LANDIS *for* Threading in Railroad Maintenance"

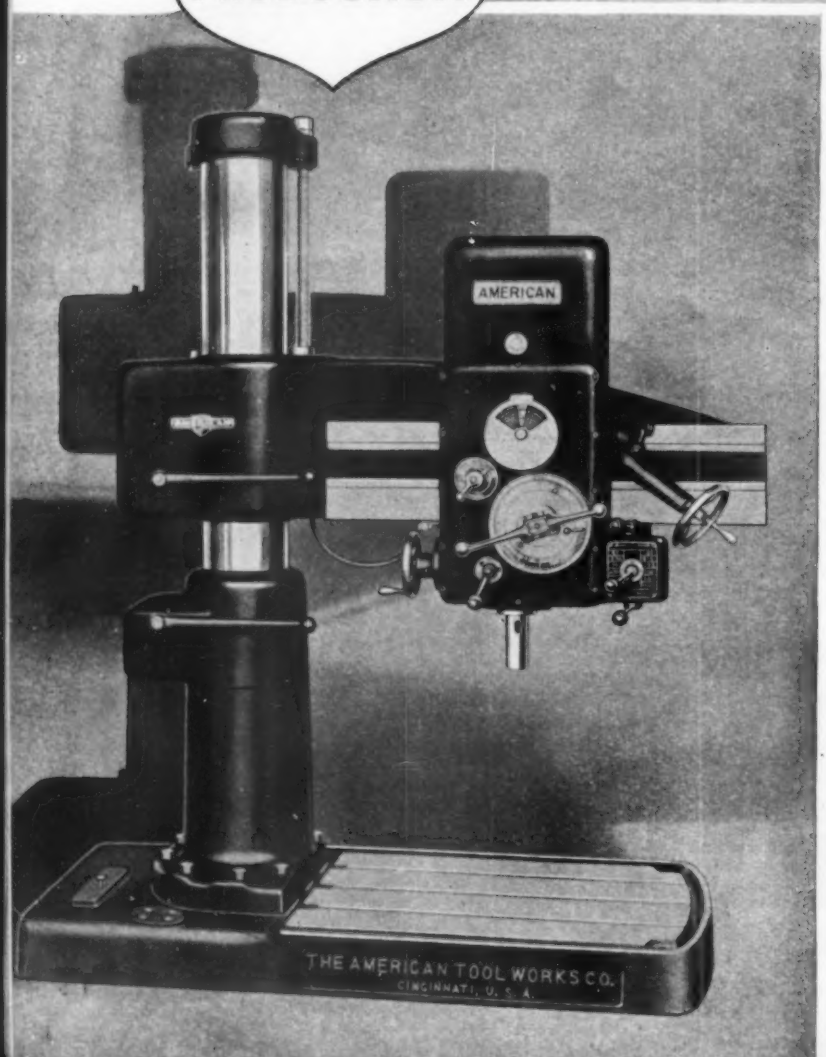
MACHINE CO. WAYNESBORO PENNA. U.S.A.

COLLAPSIBLE TAPS DIE HEADS PIPE THREADING MACHINERY

BUILT FOR THE TOUGH JOBS

"AMERICAN"

FOR ALL-OUT PRODUCTION



AMERICAN planes are built for the toug jobs that lie ahead . . . And "American Hole Wizard Radials are handling some of th tough metal-working jobs that must be pe formed before these planes go into actio "American" speed, stamina and accuracy a making it possible for aircraft manufacturers t maintain maximum output on every assignme . . . to perform the most exacting jobs ever de manded of any radial drill . . . and to keep o turning out work to aircraft standards of acc racy until victory is achieved.

Your War Bonds and Stamps are buying Army P-39 Airacobras like the ones shown above. Keep on buying and they'll keep on flying!

THE AMERICAN TOOL WORKS CO.

Lathes Radials Shapers

CINCINNATI OHIO

Photo courtesy Bell Aircraft Corp.

HARDINGE

Style "B"

Master Feed Fingers and Replaceable Pads save feed finger users 30 to 80%----

Use the above illustrated master feed finger and pads and save 30 to 80%. The low cost replaceable pads are available in hardened steel, bronze or cast iron. This provides a selection for best wearing qualities and the elimination of marring or scoring of stock. Pads have an integral lug—no pins or screws to cause trouble—an important characteristic. Master feed finger is heat-treated for sustained tension. Available for automatics and turret lathes employing feed fingers with capacity from 5/16 to 1-5/8". Pads interchange between machines with similar capacity.

Learn all the advantages by asking for this illustrated bulletin containing complete information. Available to purchasing agents, superintendents, foremen, engineers, set-up men and operators in organizations which have a screw machine department.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

To Finish The Job Quicker . . .

CONSIDER THE SHOULDER

The story here has to do with the side of the grinding wheel at work, rather than the face. On any precision grinding machine, the side of the wheel may be utilized, but the speed and efficiency of such operations may be immensely improved if the Landis shoulder grinding attachment is employed.

A quick picture of the appearance of the attachment and what it will do may be gained by following through the series of views on these two pages. Beginning in the upper left-hand corner, the illustrations show:

N-66—The Landis shoulder grinding attachment used in connection with crank grinders and the heavier plain machines. A handwheel convenient to the operator permits smooth, easy lateral feeding of the wheel as required.

C-52—Grinding a flange of a radial crankshaft section on a Landis 25" Type D Radial Crank Grinder.

N-59—Grinding the pins and adjoining flanges of a long in-line crankshaft on a Landis 25" x 96" Type DD Hydraulic Crank Grinder.

J-186—The Landis shoulder grinding attachment used in connection with the universals and smaller plain machines. A convenient lever moves the wheel laterally, while an indicator shows the amount of movement.

J-159—Grinding grooves accurately to width on a Landis 12" x 72" Type C Hydraulic Universal. Work is located laterally in exact relation to the wheel by means of the indicator shown.

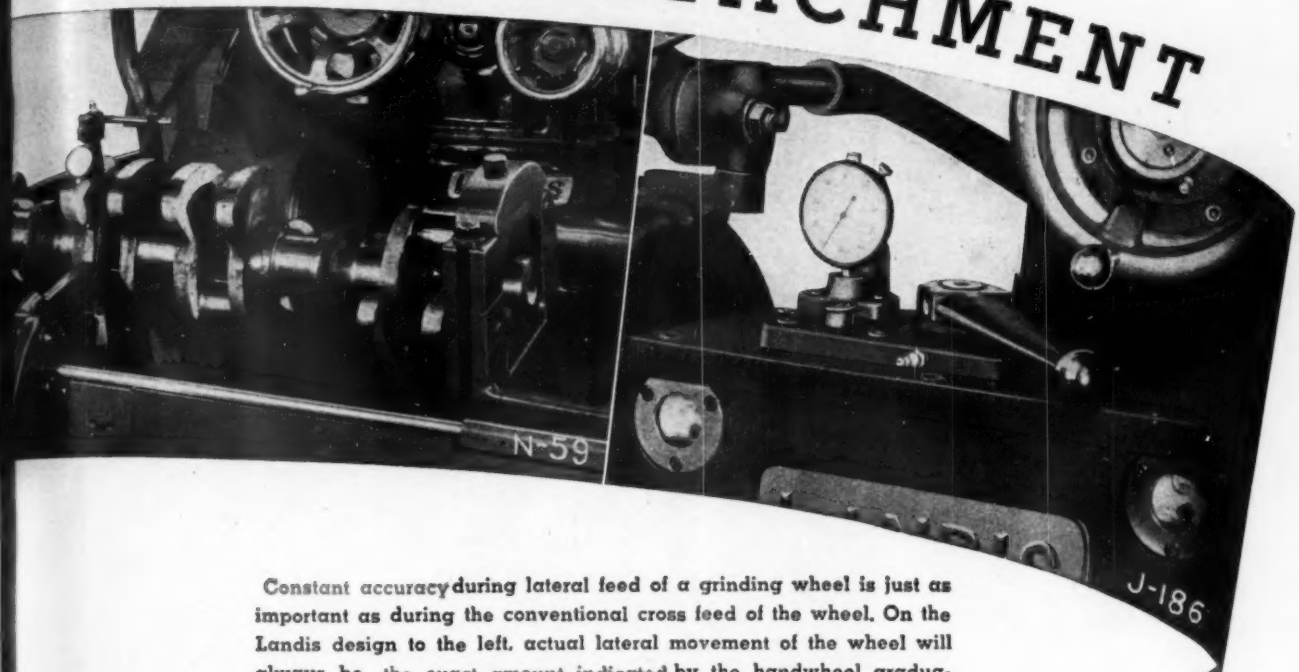
J-187—Grinding the shoulders of a small high speed spindle where the relationship between the two ground surfaces must be maintained within an exceedingly close limit. The machine used is a 14" x 36" Type C Hydraulic Universal.

Landis engineers have had considerable experience in the application of the shoulder grinding attachment and would like to share this experience with you. They will do this gladly once they are familiar with the problems you are facing.

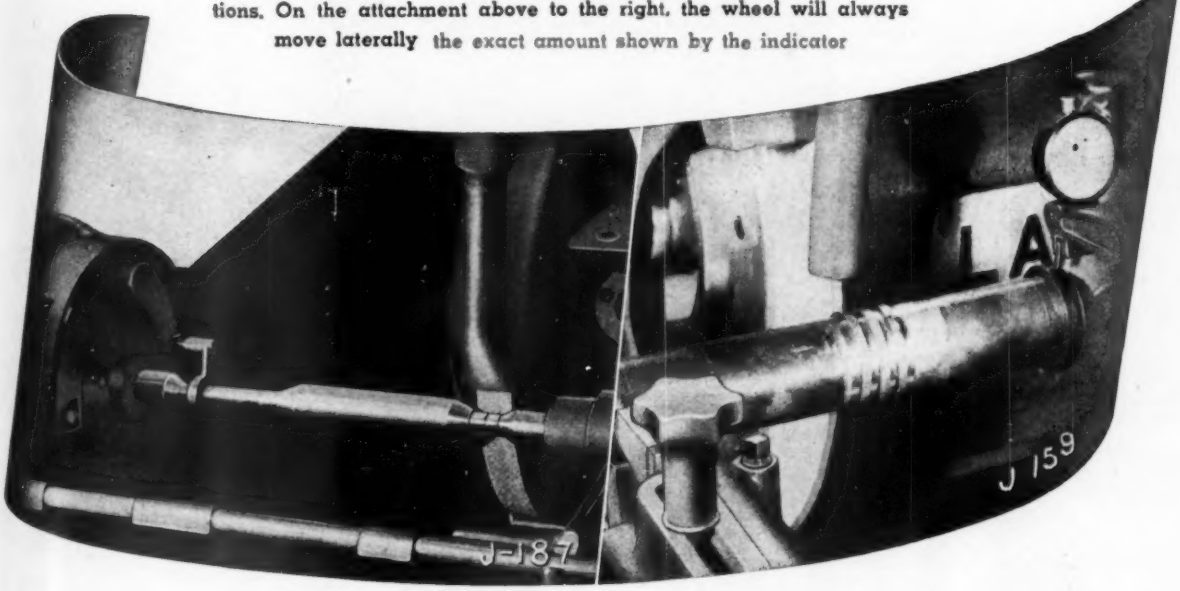
Unusual Performance as Usual

PRECISION LANDIS GRINDERS

GRINDING ATTACHMENT



Constant accuracy during lateral feed of a grinding wheel is just as important as during the conventional cross feed of the wheel. On the Landis design to the left, actual lateral movement of the wheel will always be the exact amount indicated by the handwheel graduations. On the attachment above to the right, the wheel will always move laterally the exact amount shown by the indicator



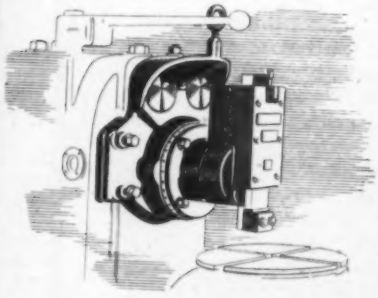
LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

LANDIS EXCELLENCE

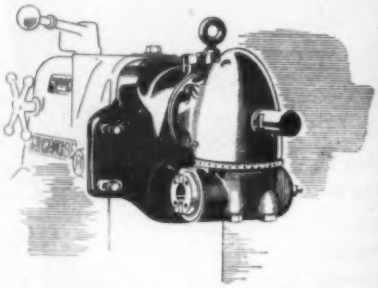
CONTRIBUTES TO VICTORY

496

CHECK over the attachments shown here—they are representative of a complete line of accessory equipment which can increase the usefulness of your present Milwaukee Milling Machines.

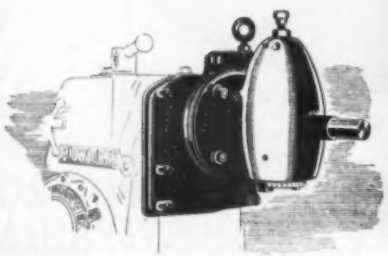


Slotting Attachment. Many slotting operations can be performed by using this attachment in connection with the dividing head or rotary table. In many cases, it makes the purchase of a Slotting Machine unnecessary. Bulletin No. 656B.



Standard Universal Milling Attachment — quickly converts a horizontal milling machine for vertical operations—also permits milling of single and compound angles on dies, jigs, fixtures. Can be swivelled 360° in two planes. Information in Bulletin No. 653.

Rotary Table — Index and Hand Wheel types — for speed and accuracy in circular milling and drilling and boring operations. Available in 12-16-20-24" diameters either hand feed or power feed types. Write for Bulletin No. 652F.



Heavy Duty Swivel Head Vertical Milling Attachment—quickly adapts a horizontal milling machine to vertical milling. Can be rigidly mounted in place in less than ten minutes. Its spindle speed is the same as the milling machine spindle. Write for Bulletin No. 752C.

Kearney & Trecker representatives are trained in all phases of milling practice. They are at your service to suggest ways and means to get the most from your present Milwaukee equipment. Write for the name and address of the nearest representative — make use of his knowledge and experience—there is no obligation involved.

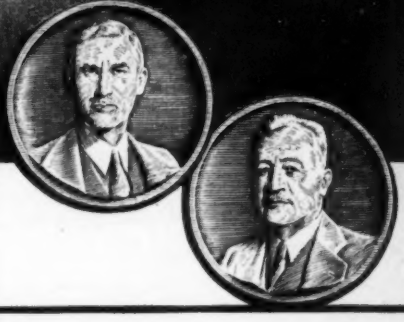
The Shipbuilding Industry *Couldn't wait!*

. . . small sub-contract shop uses Midgetmill attachment to step-up production!

Recently a small machine shop in the South, doing sub-contract work for a shipbuilding yard, was faced with a production problem. They were making semi-steel gear reduction cases on which it was necessary to drill several holes for oil pipe connections. The holes were at different angles and various depths. *All the shop had was one milling machine* and several lathes. When called in by the big "boss," our Emergency Production Service man recommended using a Milwaukee Midgetmill

Milwaukee . . .

with the standard Thou-Meter in conjunction with the single milling machine. He showed him how all the holes could be drilled in one location by swinging the head of the Midget-mill to the required position. The Thou-Meter quickly enabled the operator to get the proper depths. Best of all — costly fixtures were not required . . . This is another actual story taken from our files in which an attachment solved a production problem. May we help you with yours?



KEARNEY & TRECKER
CORPORATION

MACHINE TOOLS

"Why can't a woman take your grinding course?"

Miss Snyder asked

Because I take to grinding better than most girls in our class of apprentices, I expect to be assigned to our new 6"x30" Norton cylindrical grinder. I'm afraid I don't know too much about this machine and grinding in general but I want to learn how to grind as well as some of the men in this shop.

The men here have been talking about being sent to Worcester for grinding supervision instruction at Norton Company. That's what I'd like to do also, but there's been no mention of any women taking this grinding course. I don't see why not. We women are expected to run a regular machine and turn out a man's work. So why shouldn't some of us become supervisors, too?

GRINDERGRAM

Provide the best possible center holes consistent with the quality of work desired. No work can be ground with a greater degree of accuracy (roundness) than that of the center holes in the work.

NORTON *and*

Yes, why not?

and Miss Snyder has now completed the NORTON VICTORY GRINDING COURSE

MISS Snyder's interest in doing her job better paid dividends. She and another girl were sent to Worcester by their employer and now they are back training and supervising other girls. And that is the object of the Norton Victory Grinding Course — to give group leaders, foremen and assistants, apprentice instructors, tool and methods engineers and other supervisors in the war industries practical instruction in the selection and application of grinding wheels and the operation of grinding machines.

The course includes trips in the factory, sessions in the research laboratories for blackboard talks, mechanical demonstrations and motion pictures. Norton application specialists, sales engineers and laboratory men conduct round table discussions.

Write for information if you have men or women who would benefit from such a course.

NORTON COMPANY, WORCESTER 6, MASS.

M-465

JOB OR DOLE

—which?

All Americans agree that men returning from the war should be assured the four freedoms they are fighting for—especially freedom from want and freedom from fear.

We disagree, however, with the implied premises from some in high places that such freedom should be gained by continued governmental support, rather than through the resources of free enterprise.

The way to provide for these men is with jobs—doing useful work, making and selling things that will maintain our American standards of living, and help these men maintain their own self respect.

To make these goods, we'll need new tools. Many machines now in use will have worn out under the merciless grind of war production. Many others will be outmoded by new processes, new developments.

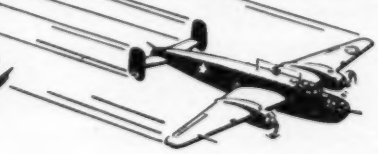
Alert manufacturers, even now, are scanning their products, processes and plants with an eye to postwar operation. Such planning offers no interference with War production. For instance, at Monarch, new lathes are already in the design stage, ready for building, testing and delivery, as fast as compatible with our Victory commitments.

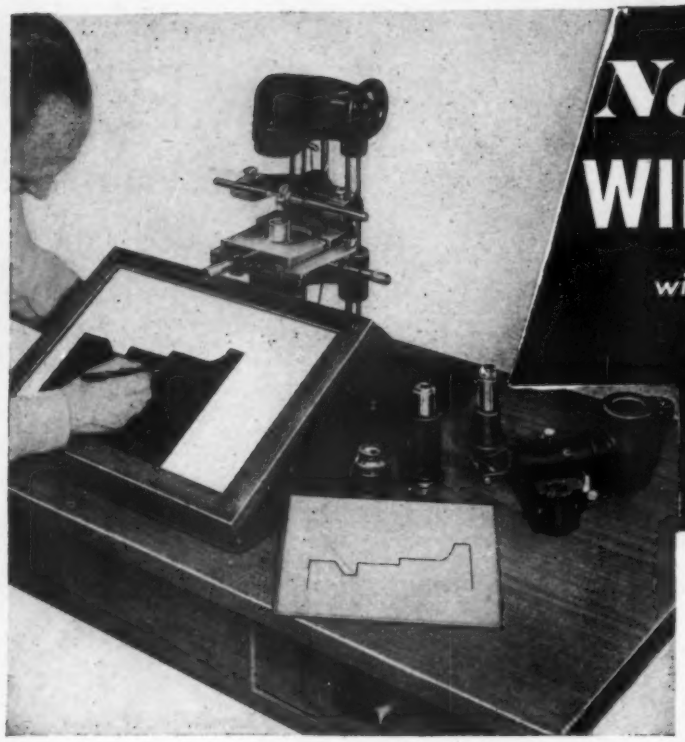
We invite American industry to discuss with us, now, their postwar requirements. The time may be short—or it may be long, but much can be gained by starting today to plan for tomorrow. Only in this way can we be ready to welcome our men of war into peacetime jobs that will insure them the fruits of the Victory they will have won.

THE MONARCH MACHINE TOOL COMPANY · · · SIDNEY · OHIO

MONARCH LATHES

Save Time





New Model WILDER PROJECTOR

with:

- Improved Optical Efficiency
- Greater Convenience
- Wider Utility

An outstanding feature of the Improved Wilder Micro Projector is a larger condenser 2″ in diameter (instead of 1½″ previously) which provides a larger, more powerful beam of parallel light and permits the use of larger diameter lenses in the low power series. This development results in greatly increased optical efficiency. Diameter of the new 10x lens is 1⅜″ and the new 20x lens 13/16″.

In addition to the larger condenser, a newly designed, fully enclosed streamlined head and better ventilated lamp house are provided. Spiral gears are now used in the focusing motion to assure maximum smoothness in operation. Setting thus becomes self-locking.

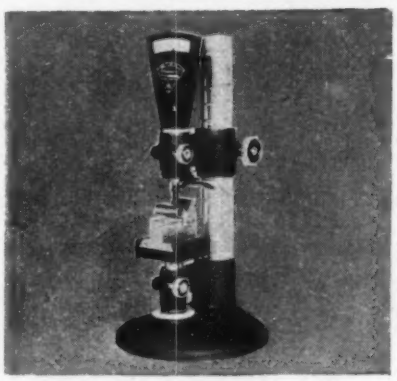
Other improvements include setting of lens in larger and heavier mounts to facilitate changing and proper positioning in the lens cone.

The Wilder Projector is wide in utility and can be used for such measuring and comparing services as checking threads, tools, gages — for verifying tool settings, checking and controlling tool wear, finished parts inspection and many other purposes.

Base Price $268.75.

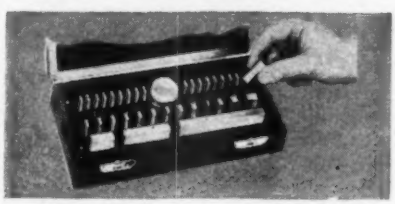
Send at once for complete description and detailed specifications.

OTHER INSTRUMENTS IN THE SCHERR LIMITED BUDGET INSPECTION LABORATORY



Scherr Comparitol—for checking gage blocks, gages and work for size, accuracy and wear.

Price $195.00



Ultra - Chex — a 34 block set accurate to .000008 and providing a basic standard of measurements.

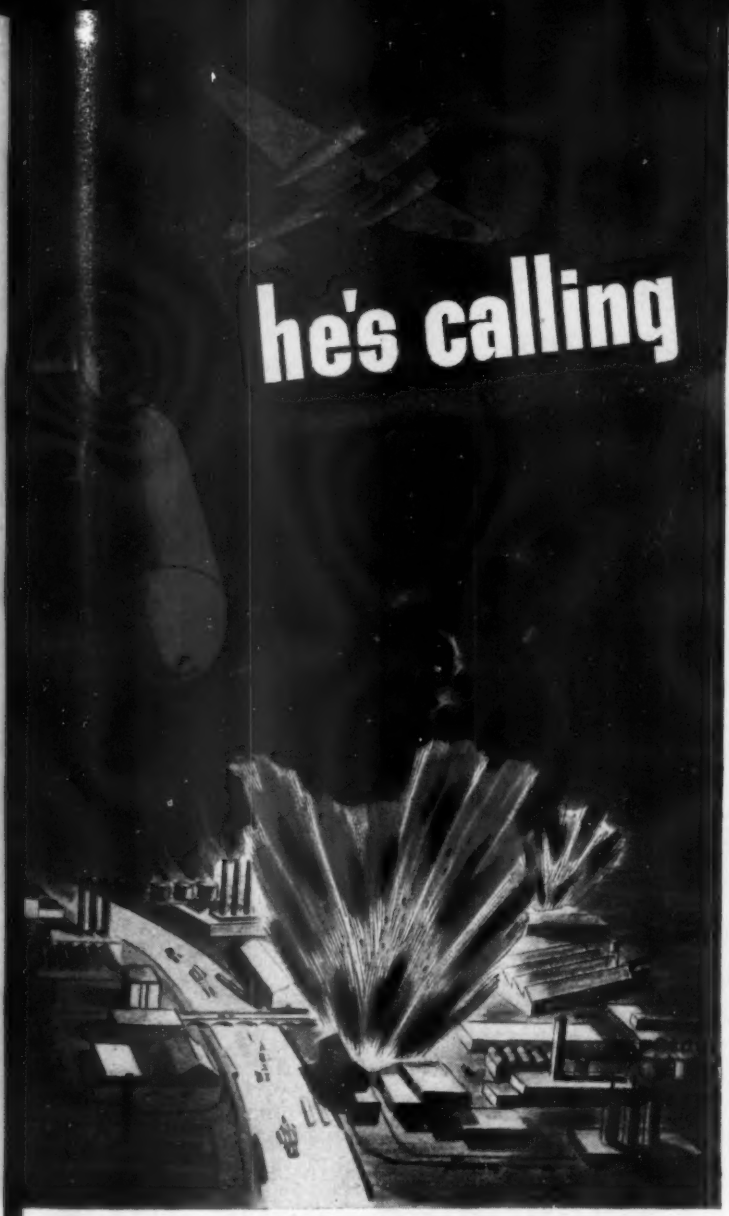
Price $125.00.

Optical Flats — for testing gages and lapped parts for parallelism and flatness.

Price $25.00.

Complete details available promptly on request.

GEORGE SCHERR COMPANY, INC. 124 LAFAYETTE ST., NEW YORK, N.Y.



he's calling his shots

ARE YOU?

● HE is our Army, Navy and Marines. The job they are doing is bringing us closer to a "peace-work" job, faster than we had dared hope for. Peace, when it comes, lasts for only a few minutes of whistle-blowing and bell-ringing. This is the signal for American business to take the ball and score—or (pray, no) fumble and stumble in a muddle of our own making. HIS clear sights are pointed to the green lights of all-out peace-time production and prosperity. American bombardiers are "on target". Are you? Call your shots, Mister Businessman. Call on LeBlond NOW for improved turning equipment.

THE R.K. **Le BLOND** MACHINE TOOL CO., CINCINNATI, 8

NEW YORK 13, 103 Lafayette St. CAnal 6-5281

CHICAGO 6, 20 N. Wacker Dr STA 5561

Check-Clip-Mail

FOR ILLUSTRATED SPECIFICATIONS:

- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ TOOL ROOM LATHES
- ☐ AUTOMATIC LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____

YOUR FIRM _____ ADDRESS _____

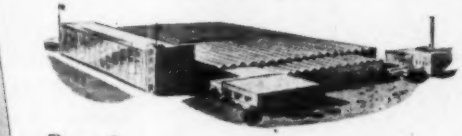
time to retool

Turn to Le Blond for Turning Equipment

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

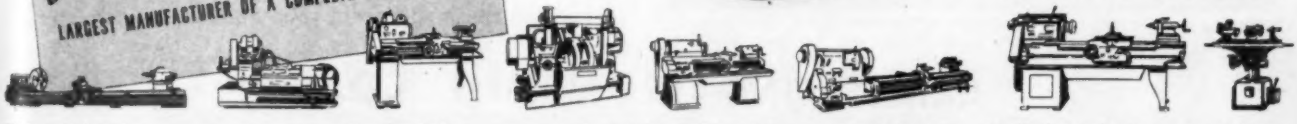
ARMY E NAVY

LE BLOND



★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!



HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

Automatic Lathes—12" & 16" Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24" Best for training.

Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.

HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.

Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

MARVEL SAWS

Mitering a structural angle iron—with a MARVEL No. 8. The blade is fed into the work. Work is held stationary on the bed in quick action vise.

Shipbuilding calls for Universal tools.

There's a lot of sawing — cutting-off, mitering, notching and special cuts wherever ships are being built, and work comes in all sizes too. That's why you'll find MARVEL No. 8 Metal Cutting Band Saws in ship yards and Navy yards, as well as in tool rooms and die shops.

The MARVEL No. 8 is the most universal sawing machine built. It will snip off an ⅛" drill rod or cut off an 18" x 18" structural shape with equal efficiency, or will save hours of machining by roughing work to size and shape. It will cut at any angle from 45° right to 45° left, has a large "T"-slotted table (for holding irregular shapes, special fixtures, etc.) and both power and hand feeds. It is a busy machine wherever found, for it does so many different jobs and does each one well.

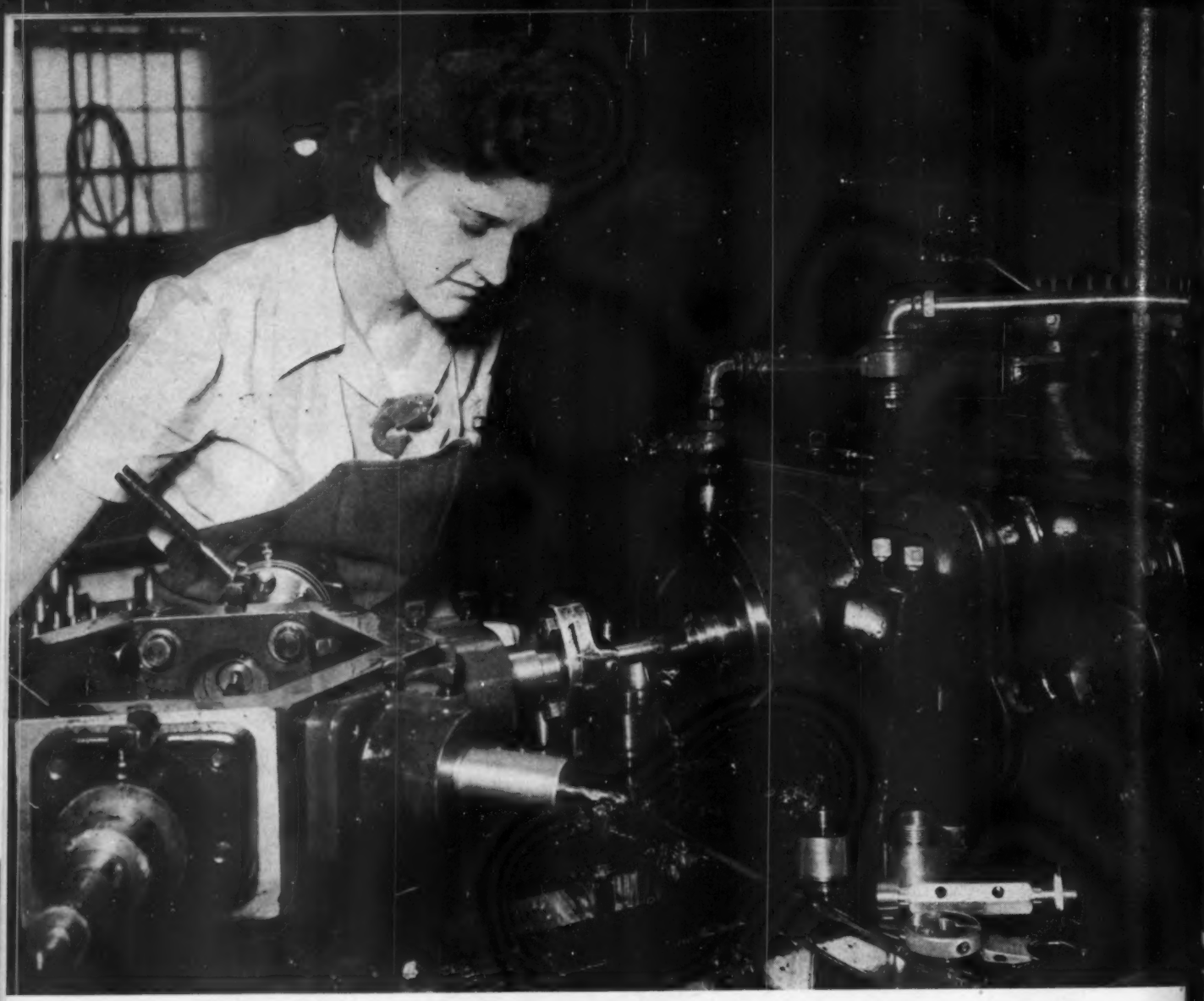
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave., Chicago, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York

FOR 55 YEARS
Kempsmith Millers Have Enjoyed
a World-wide Reputation for
PRECISION and RUGGEDNESS
In practically every section of the globe, dependable precision-built Kempsmith Machines are speeding up milling operations and helping the United Nations win today's momentous battle of production.
KEMPSMITH MACHINE CO.
MILWAUKEE, WIS., U. S. A.
KEMPSMITH
Precision Built Milling Machines Since 1888



ACME
6W TURRET LATHES

Respond to the delicate touch of women operators

● With the major portion of available man power required on our widely scattered battle fronts — the trained hands of women are skillfully handling precision work in many of our war plants today.

Precision parts being produced here by Women Operators is not a difficult job on the Acme Way Type Turret Lathe shown. The ease of operation — convenience and simplicity of control and flexibility of Acme Turret Lathes enables women to quickly pick up the fine points of operation of this accurate Turret Lathe.

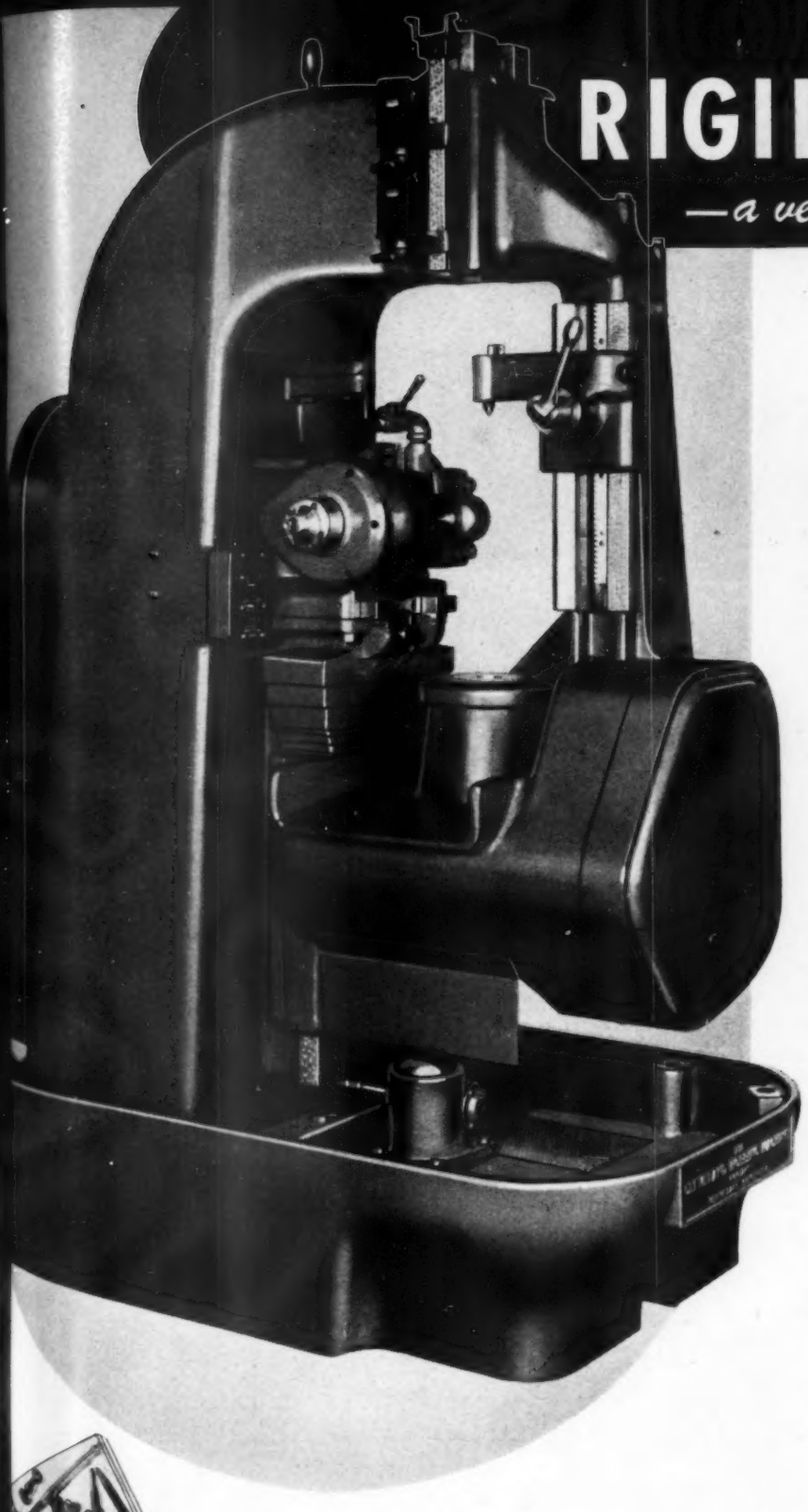
Investigate Acme Turret Lathes for your vital war work with full confidence that women operators can handle them and help you in replacing men now needed in our armed forces.

Consult Cincinnati Acme on your Turret Lathe requirements.

The ACME MACHINE TOOL CO.
CINCINNATI, OHIO

THE RIGIDHOBBER

—a versatile machine



for

ACCURATE HOBBING OF GEARS AND SPLINES

SEQUENCE OF OPERATION—

On the Rigidhobber the sequence of operation is usually a rapid traverse motion of the work head to the hob—feed motion through cutting portion—and rapid traverse back to loading position.

EASE OF OPERATION—

Operator merely loads and unloads work from the machine. One run button controls the machine. All other functions are performed automatically. A safety switch takes care of overload.

CLIMB HOBBING IS POSSIBLE

Not only will the hob run in either direction but the sequence of movement may be from top to bottom or from bottom to top. This is accomplished with transfer switches which makes machine readily adaptable to climb hobbing.

If you're looking for accurate hobbing of gears and splines and versatility of machine operation —put your next job on a Rigidhobber. It meets all requirements for accuracy and high production.

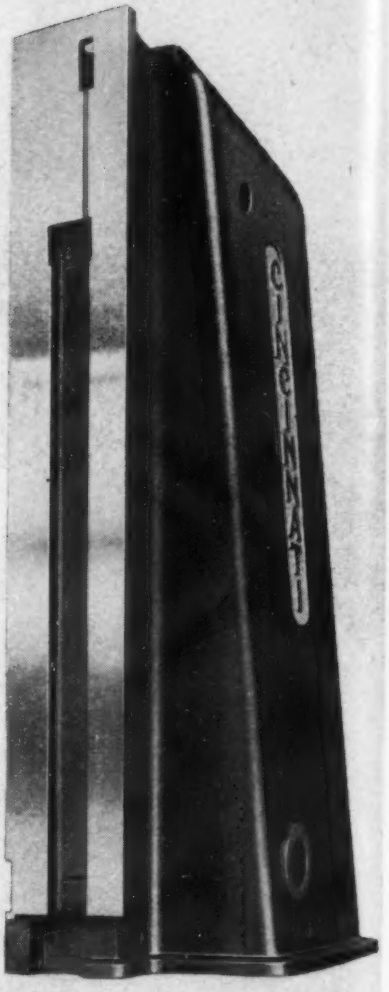
● *This booklet is full of useful information on Rigidhobber design, operation, and application. Write for your copy today.*

The CLEVELAND HOBBING MACHINE Company

Cleveland Ohio

CINCINNATI HYPRO

PLANERS • VERTICAL BORING MILLS • PLANER TYPE MILLERS

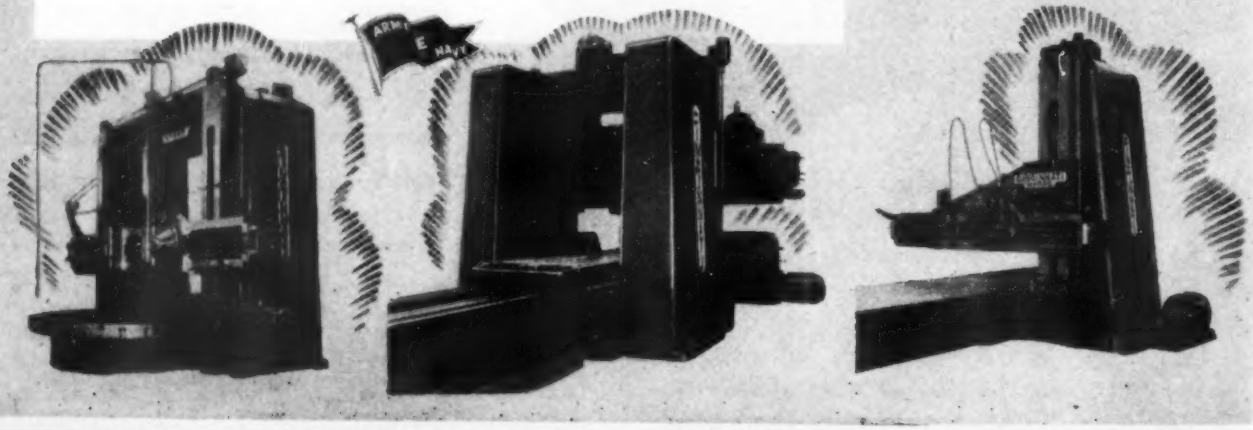


AT SUNRISE 3500 years ago, on the plains of Salisbury in southern England, the Druid priests fixed the time of the new day by the first rays seen through the pyramid type stones of their temple.

Thirty-five centuries later an English born designer, our Thomas Addison, was looking for a way to make Cincinnati Hypro Machine Tools stronger and more rigid, so their operation would be even more accurate than before.

Probably by coincidence, since Tom had never visited Stonehenge, he designed pyramid type housings that strikingly resemble some of the columns of this ancient Druid shrine. One of the central monoliths has even the same taper as that in Cincinnati Hypro housings. The massive housings are tied together by a deep box type arch—just like the columns of stone in Wessex.

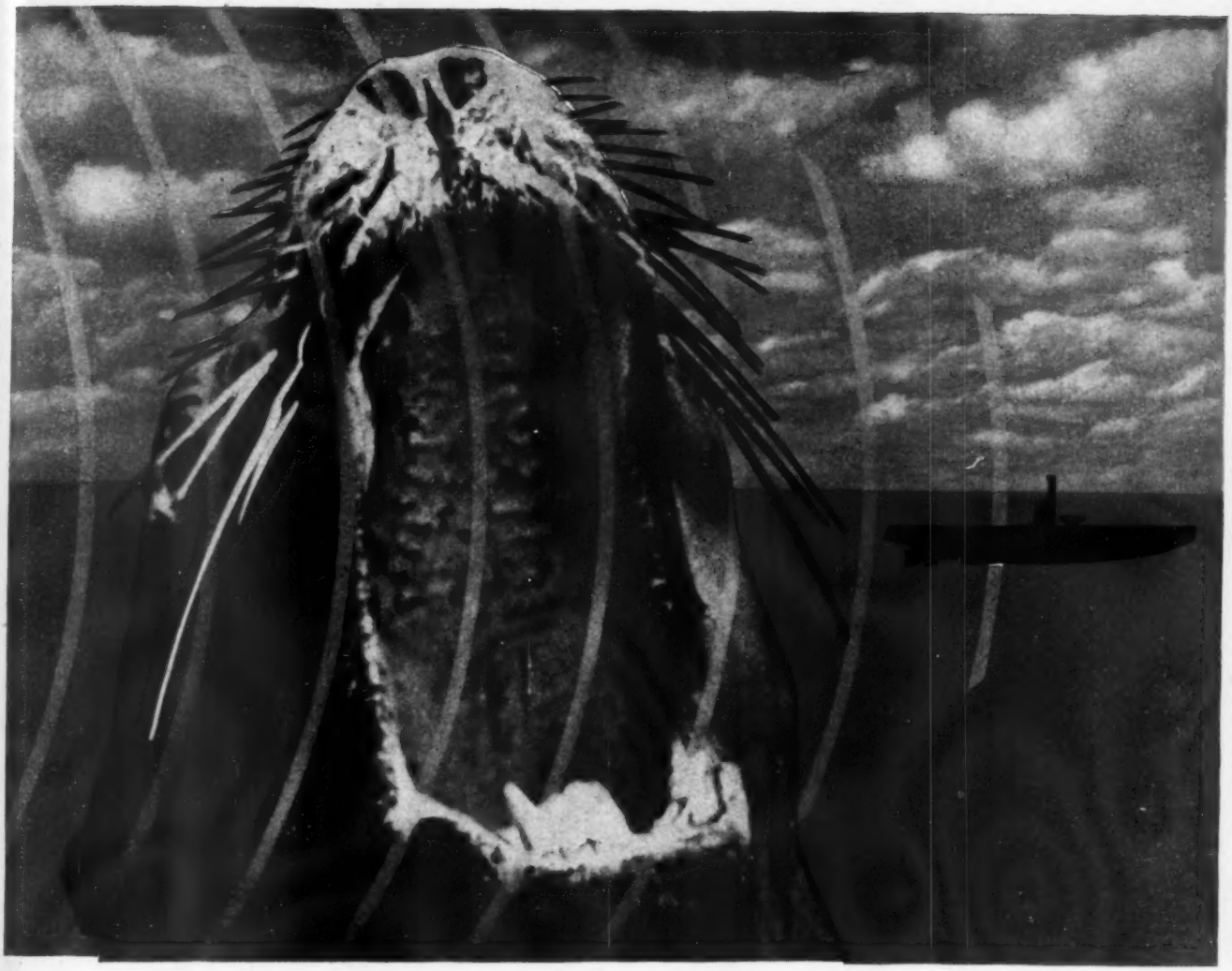
The Druids wanted accurate time. The manufacturer of today wants accurate machining at low cost. Applications of a good idea of great antiquity made a better Hypro possible.



THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.



Spotter for undersea raiders...

SEA LIONS beat their cousins, the seals, out of an important job during the early part of World War I. Both have a hoarse, barking voice. But sea lions have sensitive, external ears... seals do not.

So sea lions got the job of detecting U-boats. They were trained to bark like fury whenever they heard the vibrations of an approaching undersea raider.

Today, there are many devices for detecting the approach of submarines, but none of them depends on animals. All either depend on machines, or they are constructed with the help of machines.

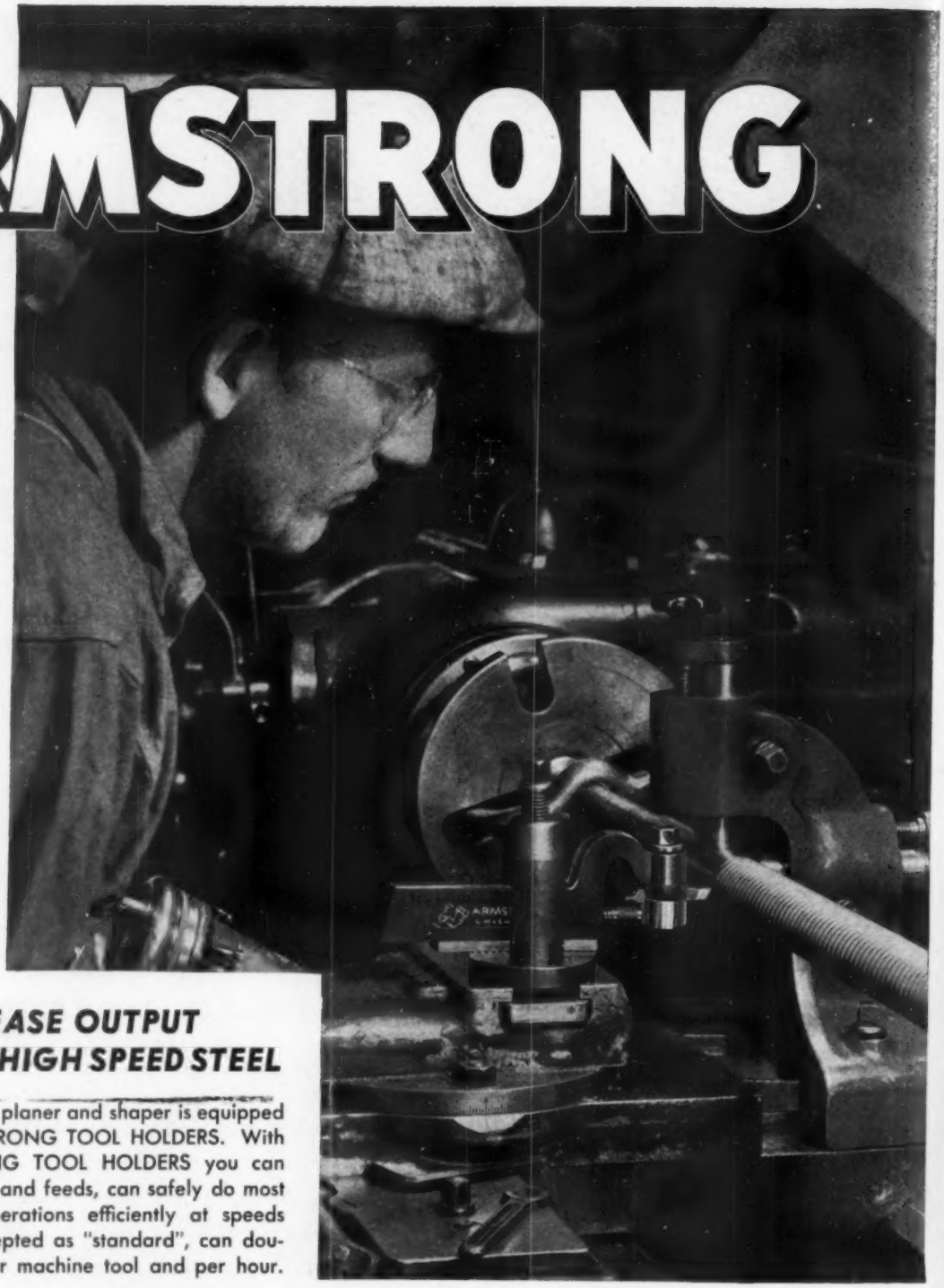
The heavy responsibility of these machines is illustrated by the fact that during the last war, German U-boats destroyed 5,408 vessels, or 11,189,000 gross tons of shipping. Today, Germany is building 20 submarines a month, each of which can potentially sink, on a single raiding trip, as many as 14 ships!

But this is only one of the wartime responsibilities of the machine tool industry. Our nation's production of airplanes, tanks, jeeps, anti-aircraft guns and munitions—all this stems from machine tools.

In wartime production, when speed is vital, the output of Cone Multiple Spindle Automatic Lathes is of especial importance. These machines can, in many operations, increase the production range as much as 10 times, depending on the character of the work. This is one of the reasons why Cone Automatics will continue to make [illegible] after victory is won.

CONE Automatic Machine Company, Inc., Windsor, Vermont

ARMSTRONG



TO INCREASE OUTPUT TO CONSERVE HIGH SPEED STEEL

. . . see that every lathe, planer and shaper is equipped with the correct ARMSTRONG TOOL HOLDERS. With the correct ARMSTRONG TOOL HOLDERS you can greatly increase speeds and feeds, can safely do most standard machining operations efficiently at speeds often double those accepted as "standard", can double output per man, per machine tool and per hour.

By using ARMSTRONG TOOL HOLDERS you make critical High Speed Steel go ten times as far, because each ounce of High Speed Steel in an ARMSTRONG TOOL HOLDER will do work requiring ten ounces in a forged tool.

Tooled up with ARMSTRONG TOOL HOLDERS you will be able not only to reach new "highs" in production, you will be able to maintain them, because ARMSTRONG TOOL HOLDERS last indefinitely—will stand up to the hardest usage year after year.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"

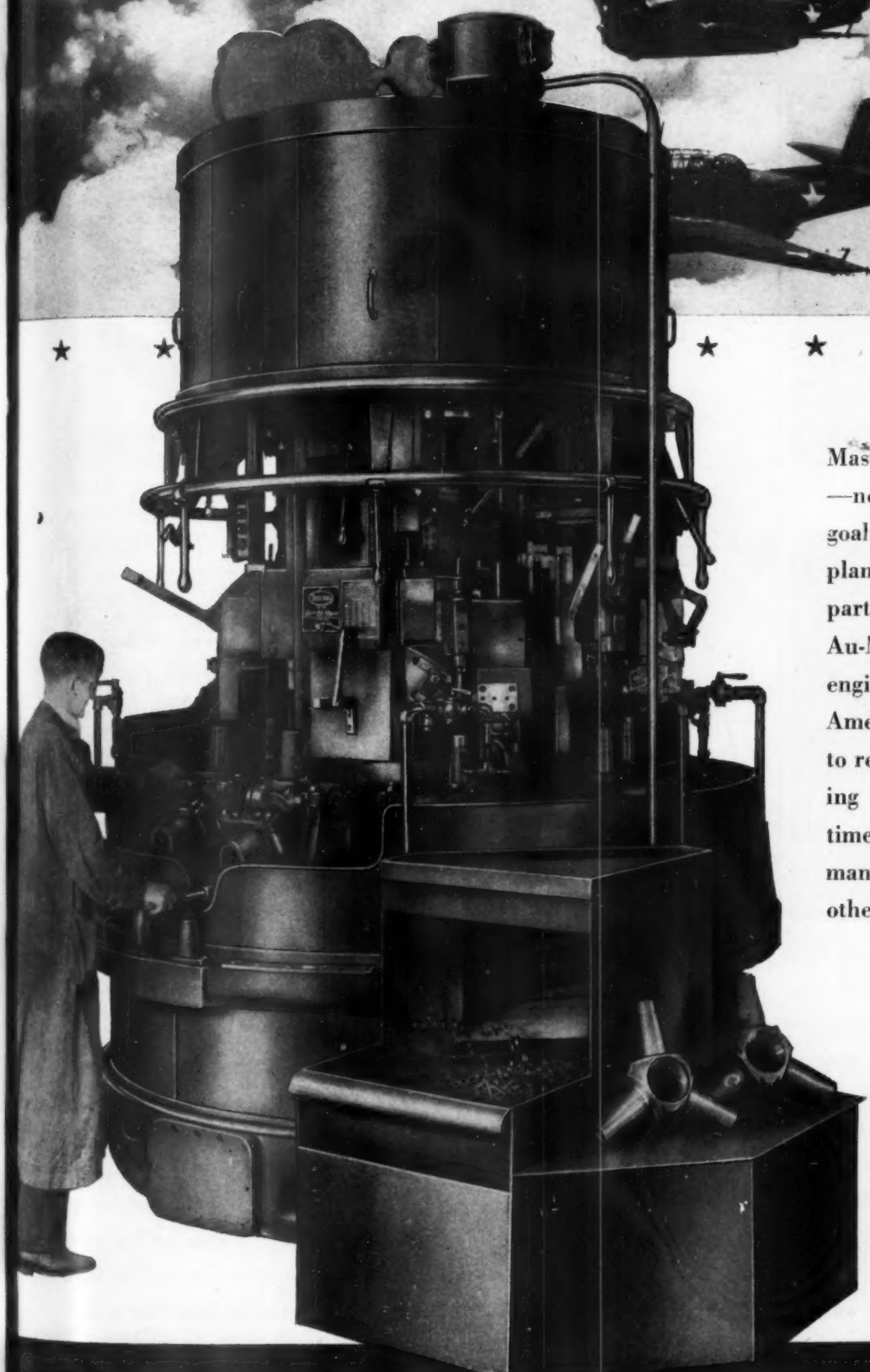
317 N. Francisco Ave. **Chicago, U. S. A.**

Eastern Warehouse & Sales:
225 Lafayette St., New York

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

That These May Fly . . .



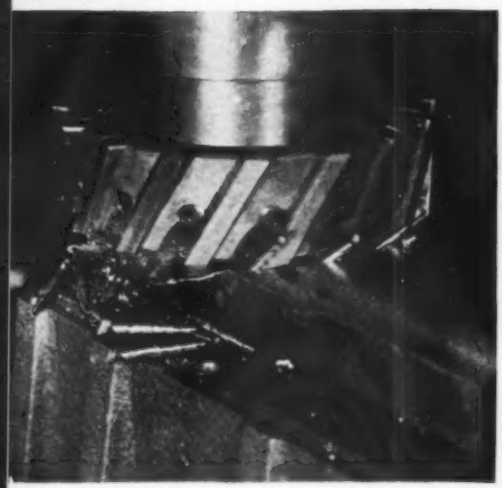
Mastery of the air on all fronts —nothing less can be America's goal. That requires ever more planes and more replacement parts—on time. Bullard Mult-Au-Matics at work on parts for engines of every important American plane are doing much to realize that goal . . . by striking reductions of production times, by constantly freeing manpower and floor space for other work.

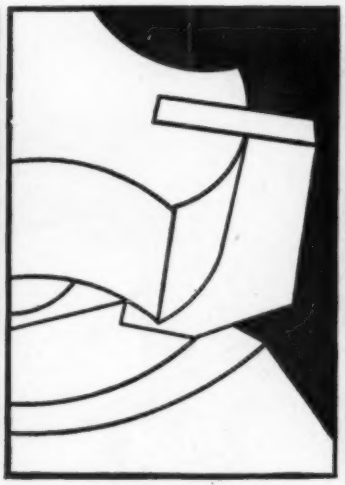
Bullard 16" - 8 Spindle Type "D" Mult-Au-Matic machining propeller hub spider. This shows the third chucking, with 3 changes of position. The Mult-Au-Matic time for 3 positions is 18 min. 5 sec. as compared to the former production time of 5¼ hours per piece.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

NEW FACE-MILLING PERFORMANCE WITH



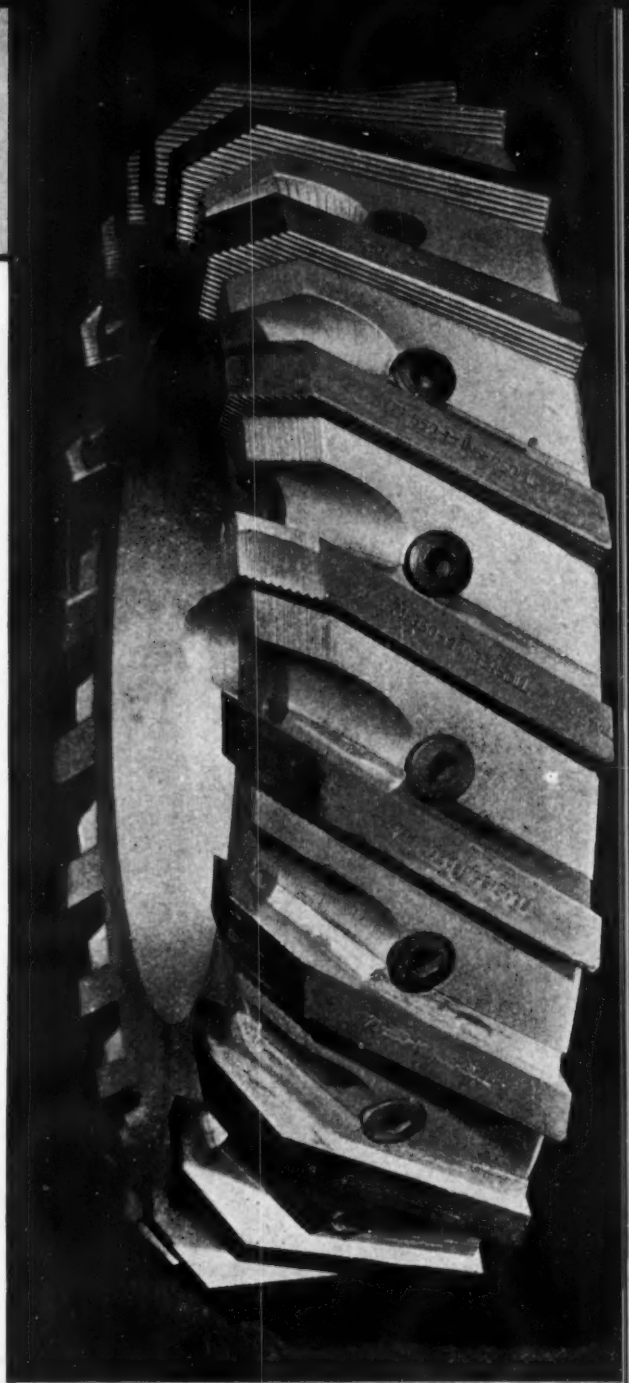


The Ingersoll Shear Clear face mill is a patented design based on the discovery of entirely new cutting angles. The blades are set in the cutter body at steep negative rake and positive shear angles . . . The blade strikes the work-piece at a point ahead of center on its beveled cutting edge and gradually increases the chip width in a shearing action. (See upper sketch). It has been proven that a blade thus eased into the work causes far less impact shock and suffers less itself than the conventional blade, whose cutting edge strikes the work-piece squarely. (See lower sketch) . . . Here the blades are set at relatively slight rake and shear angles.

The Shear Clear chip coils evenly and continuously outward and falls away from the cutter at the end of the cutting arc . . . This is demonstrated in the upper row of photographs . . . Chips of the conventional cutters break up and fall under the face of the cutter, there to be ground over the milled surface. (See lower photographs).

THE INGERSOLL MILLING

SHEAR CLEAR



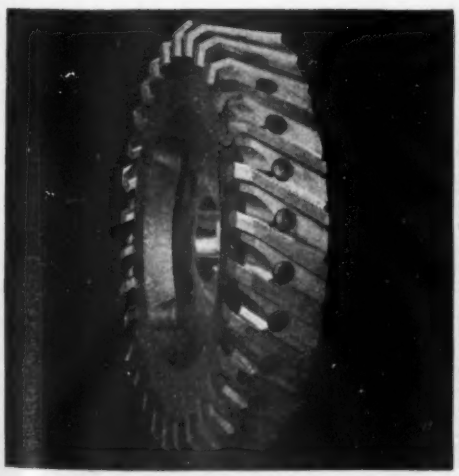
Ingersoll Shear Clear face mills are especially adapted to work in tough steel and the soft, stringy non-ferrous metals . . . They will solve many of the problems you are experiencing in milling these materials.

Some of these cutters are being used in one-cut operations, producing surfaces smooth enough to eliminate the finishing cut.

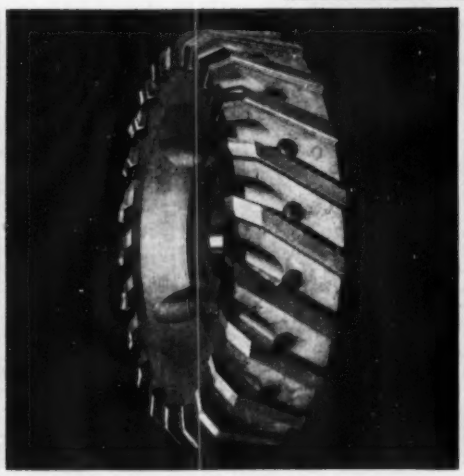
Their free cutting, shearing action permits you to use much higher feed rates . . . Many users have tripled their former feed rates. Some are cutting at four to six times faster feeds than before under identical machining conditions.

Cutting steel at 10" a minute feed, the Shear Clear cutter shown on foregoing page removed double the depth of stock cut by the conventional cutter feeding at only 4" a minute — and produced a smoother finish.

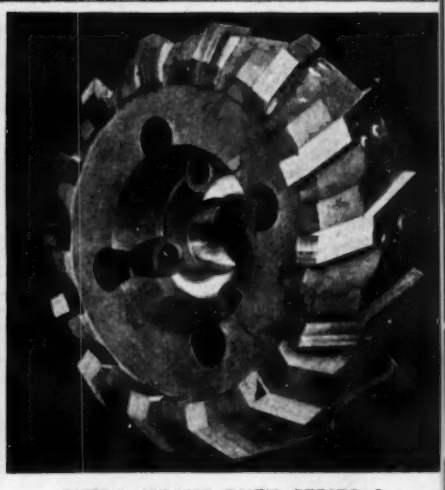
If you are milling flat surfaces it will pay you to investigate the benefits of applying Ingersoll Shear Clear Cutters to your work. Your inquiry should state diameter and hand of cutter, type of material and amount of stock being cut.



MEDIUM DUTY SERIES for milling cast iron or steel where stock does not exceed 5/16".

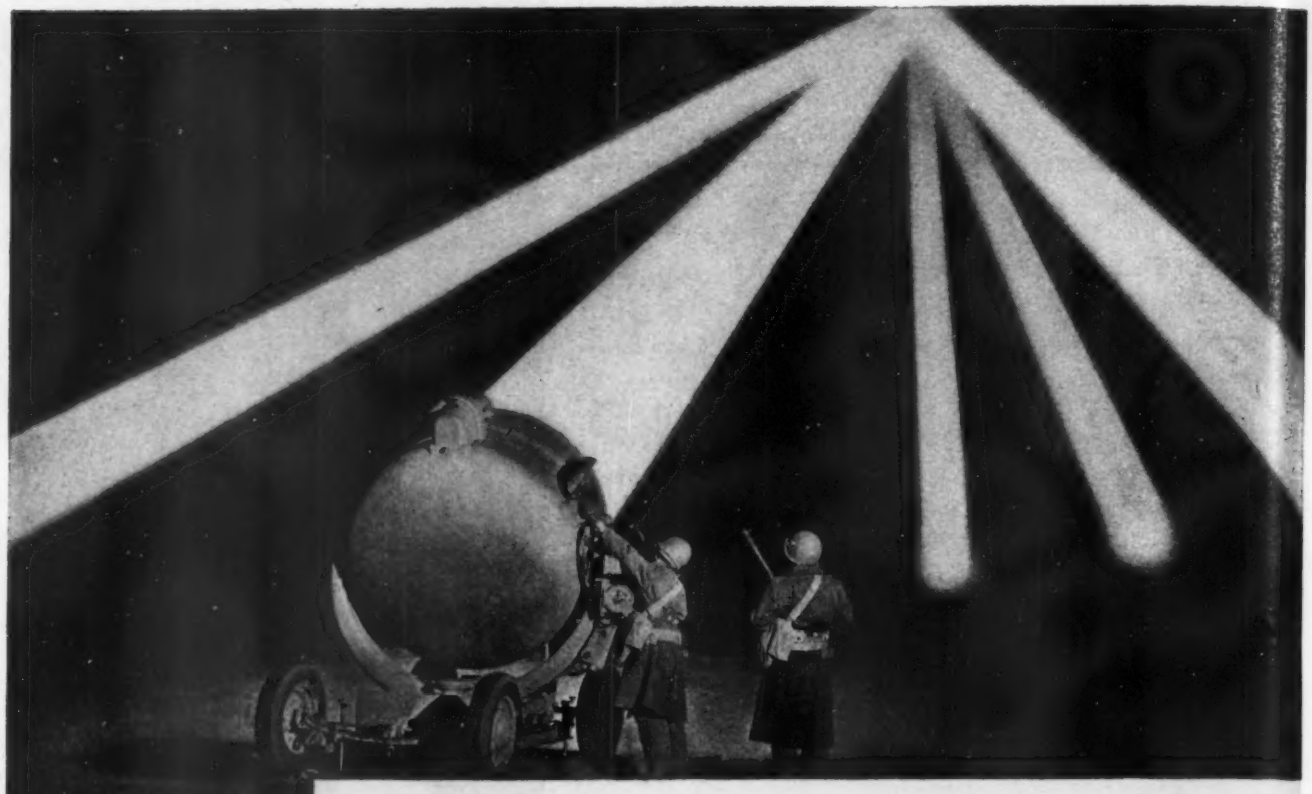


HEAVY DUTY SERIES for milling cast iron or steel where stock does not exceed ½".



EXTRA HEAVY DUTY SERIES for milling cast iron or steel where stock does not exceed 1".

MACHINE CO., ROCKFORD, ILL.



Sky Trap for Zeros

SET AND SPRUNG... IN SECONDS... BY MATCHED MOTOR AND CONTROL

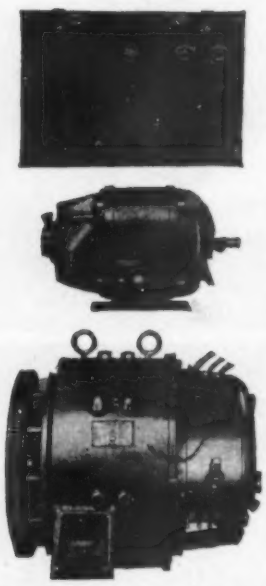
The siren wails ... the searchlights and locators of this "Zero Trap" swing into position as a unit. Wherever the locator points, there also points the searchlight — instantly and automatically. Enemy aircraft are detected and spotted in seconds for anti-aircraft gunners to send to their doom.

This important complete co-ordination is made possible by matched motor and control which duplicate the movements of the locator. Without it, many vital extra seconds would be consumed for the operator to instruct the searchlight operator where to direct the light beam.

The power behind this "sky trap" is an engine-driven generator set — with cooling fan motor and control panel. This unit supplies power for the arcs, movements and control mechanisms of the searchlight system.

This is only one of many Westinghouse war motor applications...applications that build up engineering experiences you can use. Save time, save money, save effort on your next motor and control job. Just call your nearest Westinghouse Office for "jiffy" help. Westinghouse Electric & Mfg. Co., Dept 7-N, East Pittsburgh, Pa.

J-21126



Power plant control panel for co-ordinating searchlight and sound locator. Fan motor (middle) and d-c generator.

Westinghouse MOTORS AND CONTROL

PLANTS IN 25 CITIES OFFICES EVERYWHERE

Orders for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES

This big Ohio Horizontal handled all the boring, drilling and milling operations on a 22000-pound cast steel base for a power shovel. Performance was accurate, speedy and completely satisfactory.

Ohio's portable control (which can be ordered for the machine shown above) is a demonstrated time-saver, simplifying and speeding up many an otherwise unprofitable job. The power, precision and convenience traditional in Ohio Dreadnaughts are promoted by such features as these: unit construction, nitrided spindle, anti-friction bearings, built-in electrical power rapid traverse, narrow guide construction for all moving parts, push-button control for start-stop, forward-reverse and run-jog of the spindle, continuous spindle feed of 72" with full-length spindle support, internal gear-tooth type clutches, automatic lubrication, multiple-splined shafts with splines milled from the solid for all sliding gears and clutches.

Heavy duty and extra heavy duty models, floor and table types, 5" and 6" spindle sizes. Full range of accessories. Ask for Bulletin 300.

THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

X-rays and other physical tests have shown that this Mazlo Magnesium casting is sound; proved that molding and casting practices are right for this piece. Now our layout man checks it. When he adds his "O.K." you know the dimensions are accurate, that cores are correctly placed, and that it will machine exactly as your designers planned it.

More than twenty years' experience in working with magnesium contributed to the fine quality of this casting. Where to place gates, chills and risers to assure a sound product, how to pour the metal, what heat treatment to bring out the best properties of this alloy; these are things that doing, learning and improving have taught American Magnesium foundrymen.

Daily, tons of Mazlo Magnesium castings are being shipped to manufacturers of fighting equipment by American Magnesium foundries. Their lightness, high strength and dependability are helping produce safer, faster airplanes for our flyers.

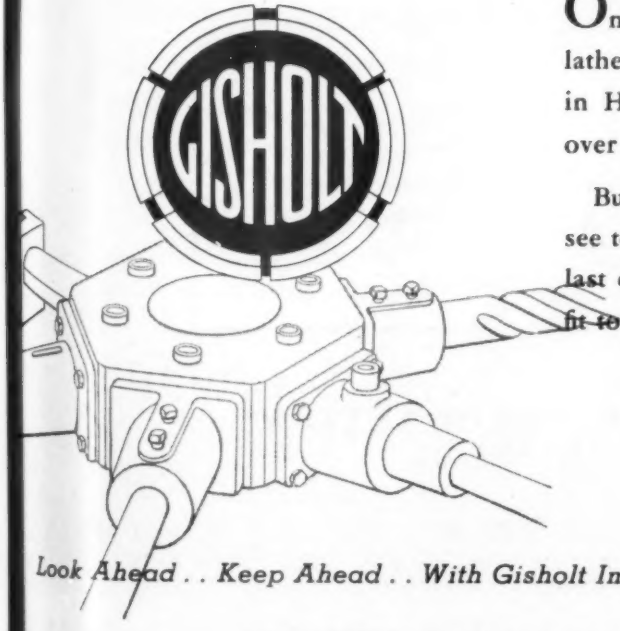
The same properties that make magnesium castings, forgings, extruded shapes and sheet indispensable today will also make them extremely valuable in your postwar products. Information is available which will help your engineers plan to use the lighter weight of magnesium to the best advantage. Sales Agent: Aluminum Company of America, 1702 Gulf Building, Pittsburgh, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

MAKE IT FIT TO FIGHT!



One after another, these airplane engine parts come off my lathe. And that's the last I see of them. Maybe they'll turn up in Hawaii. Perhaps see service in North Africa. Maybe fly over Berlin or Tokyo!

But wherever they're installed, **they'll fit!** My Gisholt and I see to that by keeping exactly to specified tolerances—on every last one of them. It's this unfailing accuracy that makes them fit to fight wherever they go.

GISHOLT MACHINE COMPANY
1201 East Washington Ave. • Madison, Wis.

Look Ahead . . Keep Ahead . . With Gisholt Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

Honing

helped change the "Horseless Carriage" Into AUTOMOTIVE TRANSPORTATION

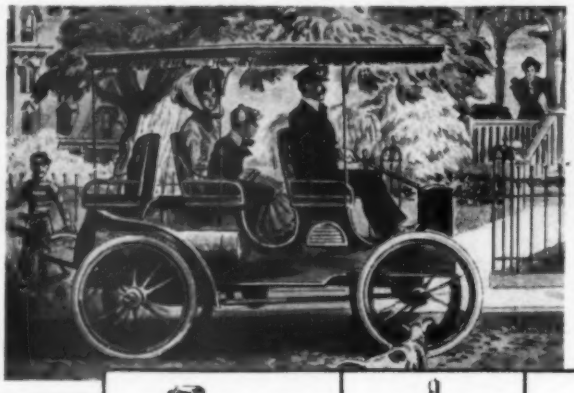
Yesterday—The horseless carriage and its immediate successors proved that a "newfangled contraption" could become an everyday useful device. Its early success could not have been possible without grinding—the first controlled abrading process.

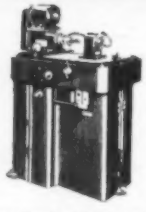
Today—The beautiful sturdy automobile is a marvel of mechanical development and efficiency. It can be well made in millions where its predecessor was poorly made in hundreds. HONING, which provides further control of abrading action, made it possible to make this refined mechanical job in huge quantity.

Tomorrow—Nobody knows what mechanical devices may suit the public need, or catch the public fancy, tomorrow. Postwar planning is not yet definite. But as today's equipment came from yesterday's developments, so tomorrow's will derive from today's. Most of the things we will use tomorrow are already developed.

One thing is certain—mechanical devices used tomorrow will demand better control of machining methods.

And Micromatic has been developing hone abrading controls to be ready for that demand.





HONING MACHINES

HONING TOOLS

HONING FIXTURES

ABRASIVE STICKS

Micromatic HONE CORPORATION

Detroit, Michigan

MAKERS OF HONING MACHINE TOOLS

The NEW Army Mule Also . . . Must Be Sure of Its Bearings

The dependable instinct of the four-legged army mule has been proverbial in all wars. He is always sure of his "bearings" wherever he goes.

The new army mule—the jeep—also must be sure of its "bearings." Tough as it appears to the eye, the jeep, like all military vehicles, couldn't take the rough going if it did not have maximum accuracy in its precision bearings.

Its bearings and other critical surfaces are finished by Microhoning—the modern abrading process which removes stock at rates up to 65 cubic inches per hour, generates accuracy for roundness and straightness of bore within .0002″ to .0003″, and, any desired surface finish.

Besides making the new mule sure of its "bearings," Microhoning has many other applications in war and peace.

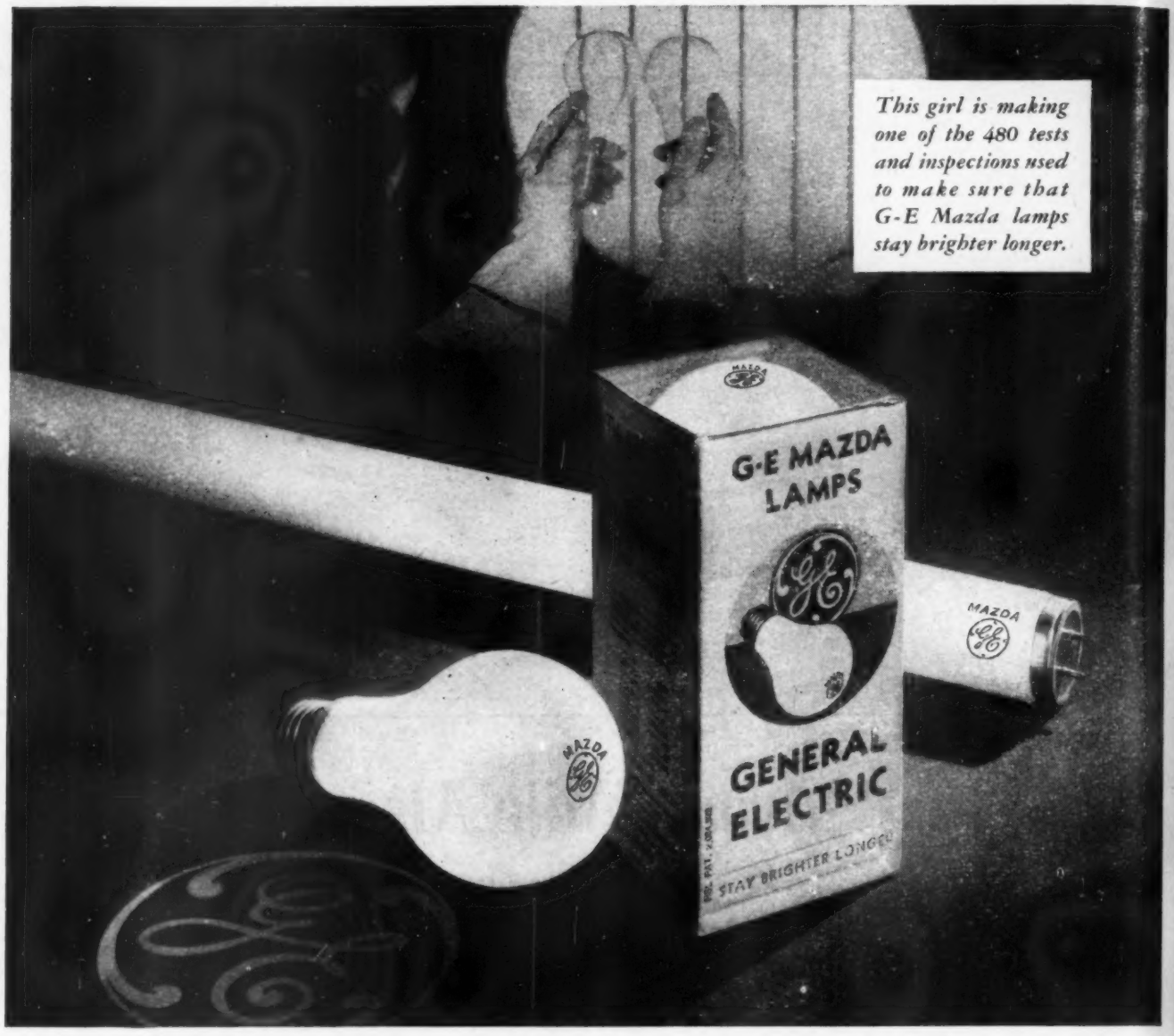
Write for Bulletin A. R. 67

Some Microhoned Automotive Bores

Cylinders
Con Rods Large End
Hydraulic Brake Cylinders
Crankshaft Main Bearing
Crankshaft Pin Bearing Bores
Cam Shaft Bearing Bores
Valve Guides
Hydraulic Shock Absorbers

MICRO MATIC

MICROMATIC HONE CORPORATION
DETROIT, MICHIGAN



This girl is making one of the 480 tests and inspections used to make sure that G-E Mazda lamps stay brighter longer.

WARTIME RESEARCH

TODAY, G-E MAZDA lamp research is devoting much of its time to war problems . . . has produced over 150 new lamps for military purposes since the war began. This same research, as well as G-E's lamp making ability and lighting experience, will bring further improvements and new developments in the G-E lamps you will be using when the war is won. In the meantime, take full advantage of G-E research benefits:

1. *By keeping lamps and fixtures spotlessly clean. Because the accumulation of dust and grease from the air can cut your light in half.*

2. *By keeping walls and ceilings clean . . . either through regular washing or painting with light colors.*

* * *

TO PRODUCTION MEN: Call G-E and ask for a wartime lighting counsellor. Without obligation, he will show you how lighting can be revamped to improve seeing—by cleaning, moving a fixture here and there, painting, or removing glare. Phone your nearest G-E lamp office, G-E lamp supplier, or electric service company.

G-E MAZDA LAMPS

GENERAL ELECTRIC

Hear the General Electric radio programs: The "Hour of Charm", Sunday 10 p. m. EWT, NBC; "The World Today" news every weekday, 6:45 p. m., EWT, CBS.

★ THE BEST INVESTMENT IN THE WORLD TODAY IS IN THIS COUNTRY'S FUTURE — BUY WAR BONDS ★

Union TOOLS

FOR WAR JOBS THAT MUST BE *Right!*

Tough jobs, "fussy" jobs, unusual jobs of war production — Union will take them all on and produce results that meet today's urgent demands for speed, accuracy and tool economy. Tools for war production must be chosen with care. Try UNION Tools on the war jobs that must be RIGHT — and we're sure they'll become the Tools You Buy Again for every job.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

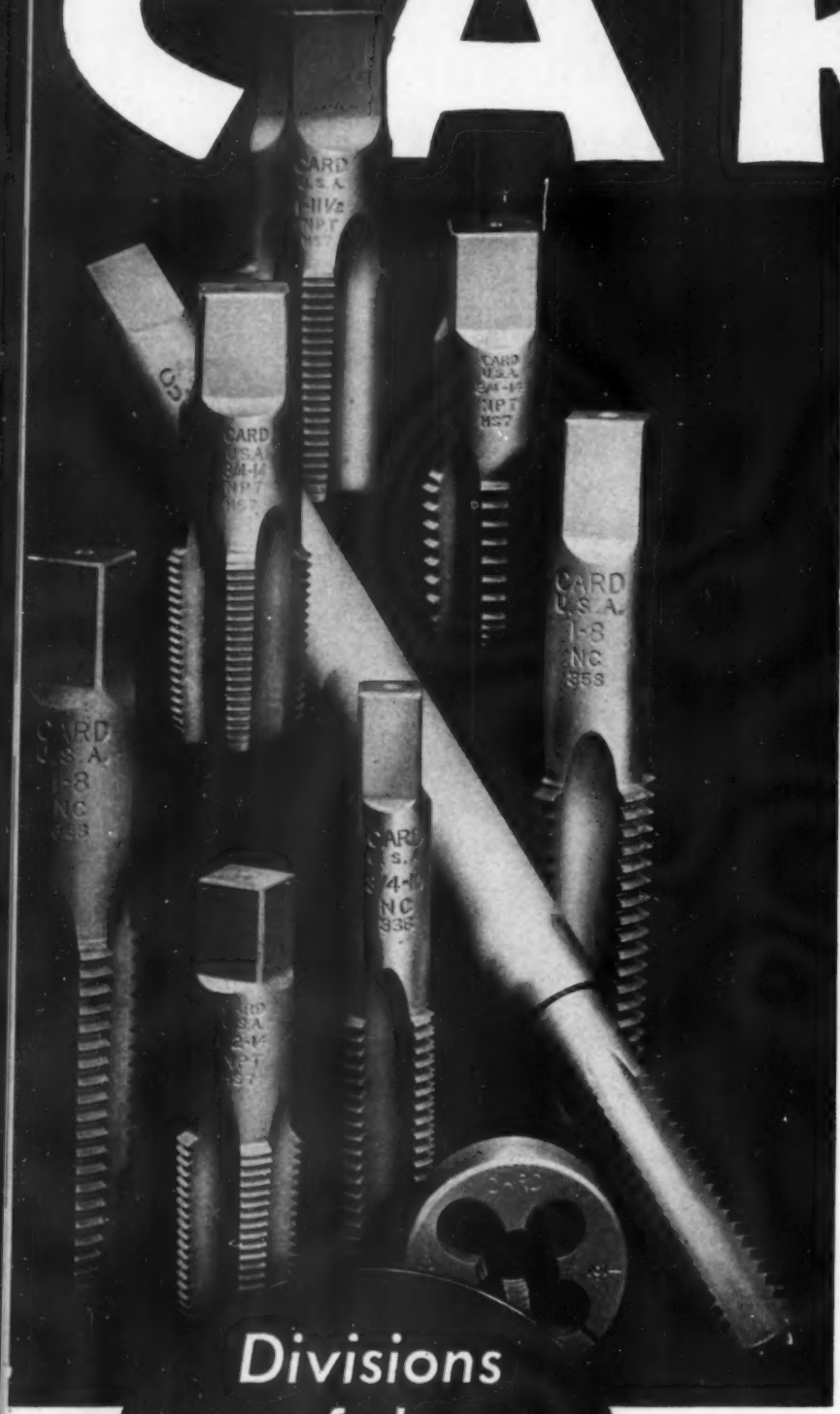
STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Divisions of the UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

CARD



Meets Today's Challenge of Production

No need to tell you that present production demands require the best in service and accuracy from every tool.

To get highest quality results from Card Taps, take advantage of Card Service . . . We will analyze your threading jobs from every angle and recommend the best procedure and the proper tap for every job.

Quality Taps plus Complete Service — a combination that goes a long way towards meeting today's challenge of production!

Divisions of the UNION TWIST DRILL CO.

S. W. CARD MFG. CO
MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
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San Francisco: 121 Second
Los Angeles: 524 E. Fourth
Seattle: 568 First Ave., So

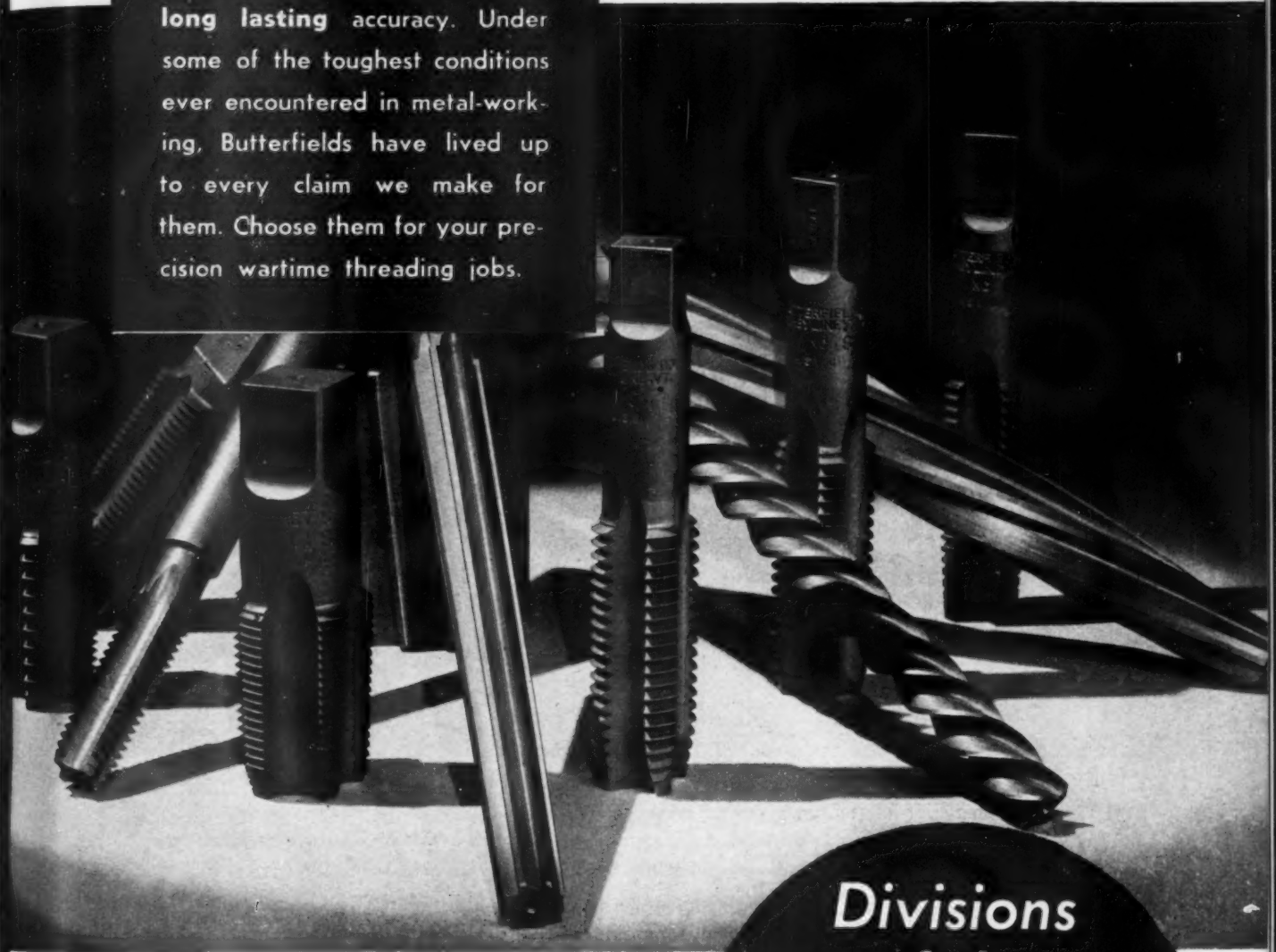
UNION BUTTERFIELD CAR

FOR A LONG LIFE OF PRECISION

Today, small tools must **last!** Tried under rigorous conditions of aircraft manufacture, tested in all branches of munitions work, Butterfield Taps and Reamers are proving their accuracy — their **long lasting** accuracy. Under some of the toughest conditions ever encountered in metal-working, Butterfields have lived up to every claim we make for them. Choose them for your precision wartime threading jobs.

Butterfield

TAPS and REAMERS



UTTERFIELD DIVISION
ERBY LINE, VT. ROCK ISLAND, QUE.

RES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. olds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth Toronto, 137 Wellington St., West. Montreal, 111 St. Paul St., West. Winnipeg, Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain—Charles chill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, nd. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and el.

Divisions of the
UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

Remember it? The dim vision of masks and gowns, of lights and gleaming things? They were phantom glimpses in a troubled dream, the night your life was saved — fragments of a shining world of science and strange skills . . .

And every appliance, every gleaming instrument — every sterile garment, swab and bandage — every accessory and apparatus there in the room, that night — was the product of machine tools, or was processed on equipment built by machine tools.

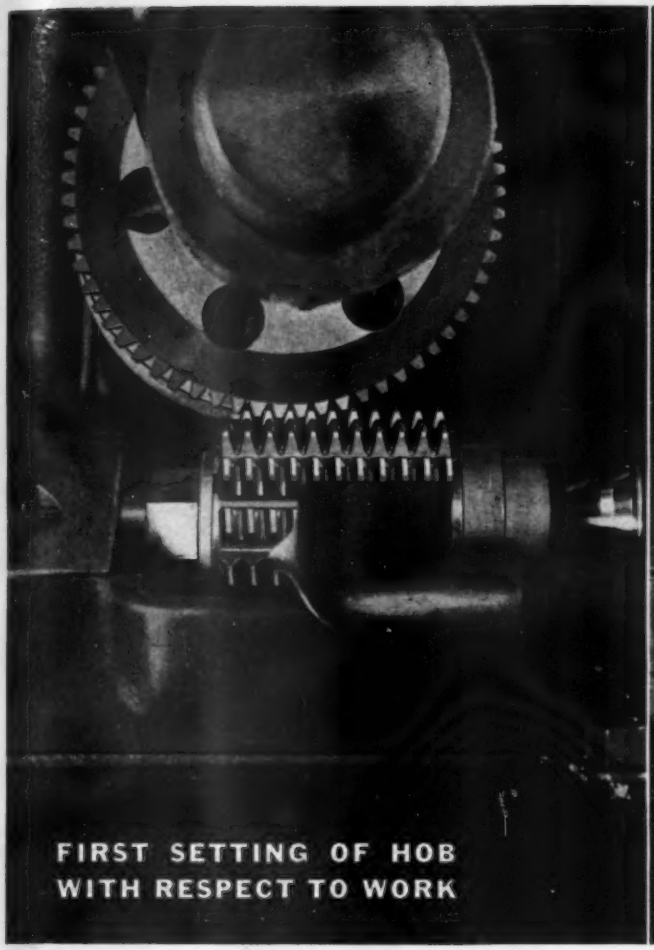
From giant hydraulic presses to the finest internal grinding machines, literally hundreds of machine tools played a part, the night your life was saved.

And of all those unseen instruments that helped to save your life that night, none is more basic to the creation of *everything* that affects your life today than the internal grinding machine.

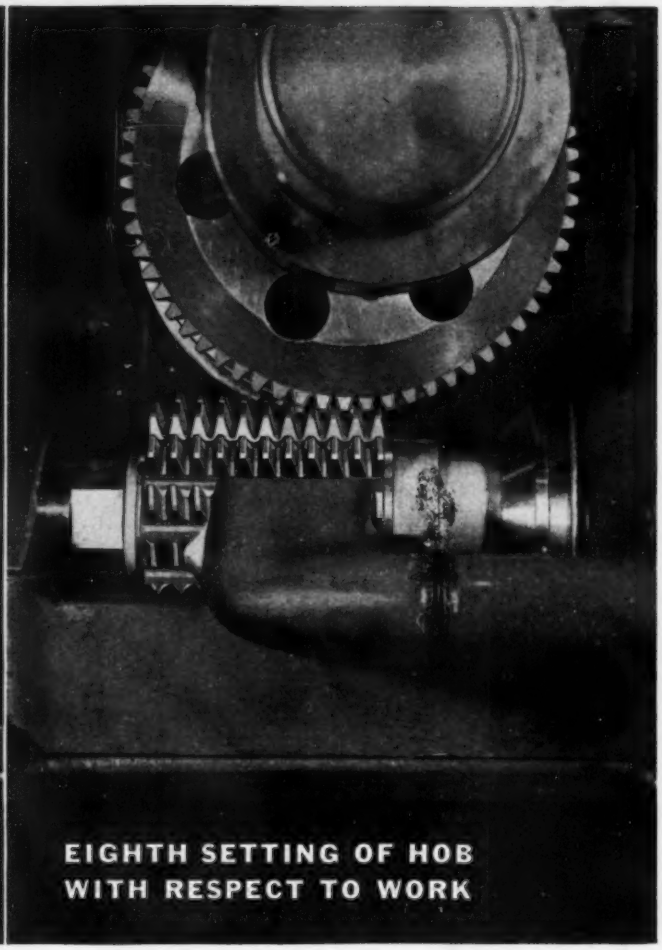
BRYANT

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.



FIRST SETTING OF HOB
WITH RESPECT TO WORK



EIGHTH SETTING OF HOB
WITH RESPECT TO WORK

SHIFTING A SET AMOUNT AT REGULAR INTERVALS GIVES UP TO 50% MORE PIECES PER SHARPENING

CAREFULLY worked out standards for how much and when to shift the hob on this job resulted in a 30% to 50% increase in the number of gears cut per hob sharpening. The gears are about 7½" diameter with 63 teeth and made of AMS SAE-4620 steel. Four gears constitute a load. The machine is run at a feed of 200" per min. and the hob speed is 103 r.p.m. on a 4½" x 4½" ground hob. A scientific approach resulted in establishing the following standards for shifting: After hobbing two loads, the hob was shifted laterally .360" or approximately one full pitch; after eight settings or shifts the hob was removed and sharpened. This resulted in an increase from 42 to 64 pieces per hob sharpening — *a 50% increase in the life of the hob.* We give this example as a practical application of tool conservation. Since production facilities for manufacture of cutting tools are taxed to capacity, it is important that every effort be made to conserve and get the most out of all cutting tools. Proper shifting of the hob is only one of several ways in which hob life can be increased. For suggestions on specific jobs, call on our field representatives or send complete data to us.

FOR IDEAS...

Barber-Colman Handbook "L", pages 271-282, contains much useful information on the proper sharpening of hobs. Follow these suggested practices to conserve your cutting tools. A reprint of this section only is available in our "How" book. Write for it.

Buy War Bonds

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

speedometer not needed . . .

One of the most important factors in accuracy of gun-fire today is the velocity at which a shell travels.

Formerly, variations in the structure and dryness of the powder made great differences in shell velocity . . . and hence, made accurate gun-fire correspondingly difficult.

Today—thanks to technical advances in powder-making *plus air conditioning*—there is so little variation in powder that gunners can know *exactly* what shell velocity will be. Result—a more accurate gun-fire that has already contributed to important American victories.

Air conditioning keeps powder at the correct temperature and humidity levels, not only in the making of the powder, but also in storage places ashore and in powder magazines on shipboard.

To meet exacting requirements like this, General Electric engineers have developed *air conditioning* and *industrial refrigeration* equipment that is more efficient, more compact, more flexible.

Now devoted to war, these improvements will be turned to innumerable peacetime uses when hostilities cease. Now for war . . . later for peace . . . turn to General Electric for efficient, compact air conditioning and industrial refrigeration.

☆ BUY WAR BONDS ☆

General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 439, Bloomfield, New Jersey.

Air Conditioning by

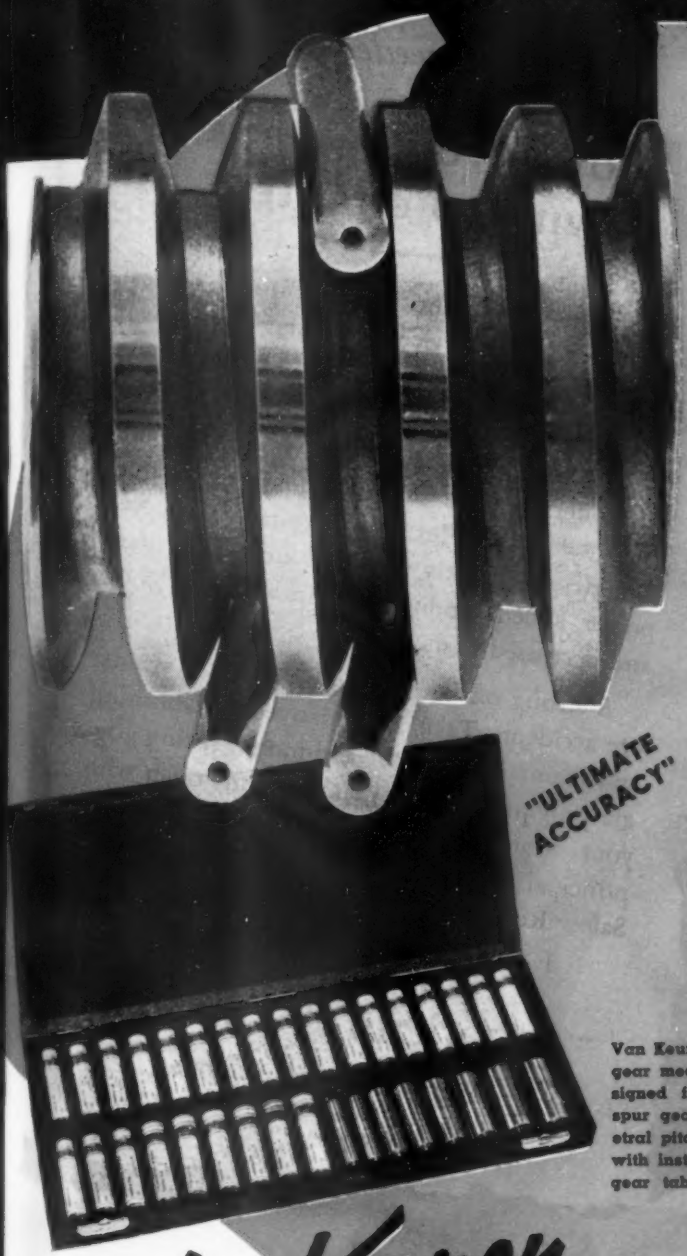
GENERAL ELECTRIC

Listen to the General Electric radio programs: "THE HOUR OF CHARM", Sundays, 10 P.M., E W T, on N B C . . . "THE WORLD TODAY" News, Weekdays, 6:45 P.M., E W T, on C B S

USE Van Keuren MEASURING WIRES

for more accurate measurements . . . of 29° and

40° WORMS, ACME THREADS, NATIONAL 60° THREADS, SPLINES *and* SPUR GEARS . . .



The 2 pitch single thread 29° worm thread illustrated can be accurately produced and measured with Van Keuren 2 Threads per inch 29° worm wires which are .2574" in diameter. Worm wires are figured to come flush with the top of the finished worm thread if the pitch diameter and form of thread are correct.

Worm measuring wires are available from stock in single sets of 3 wires of a size for pitches from 1 to 20 threads per inch and for diametral pitches from 2 to 80 or in complete assortments in the above ranges for either 29° and 40° worms.

Van Keuren measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter of a century. They are accurate to within .00002" for roundness and straightness and within .000025" for exact size. Over 200 sizes of standard measuring wires are available from stock. Special sizes from .002" to 1.500" diameter are furnished on order to meet the customer's specifications.

Van Keuren Set No. 28 External gear measuring wire set is designed for measuring external spur gears from 2 to 80 Diametral pitch. Furnished complete with instructions and simplified gear tables.....$145.00

The Van Keuren Manual No. 31 of precision measuring tools, gives complete information on how to use measuring wires for accurate measurements. Send for your copy of this valuable book.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

24th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages
Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles

He was a MASTER MECHANIC

. . . an avoidable eye injury robbed him of his much-needed skill

PROTECT YOUR WORKERS WITH AO GOGGLES

In *split-seconds,* injuries to unprotected eyes can cost you the services of workers you have spent years training . . . workers who are practically irreplaceable today.

To avoid "Lost-Time-Eyes" in your plant, AO offers a wide line of comfortable, light, cool safety goggles. An investment in AO Goggles is quickly returned in saved manpower, added production, improved efficiency, and decreased costs.

A strong offense is your best defense against eye accidents. Take the initiative in establishing and maintaining a time-and-money-saving goggle program in your plant. Get in touch with your nearest AO Branch . . . located in all principal industrial cities . . . or have an AO Safety Representative call at your office.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS
World's Largest Manufacturers of Products to Aid and Protect Vision

METRO *Standard* CARBIDE TOOLS

for
MACHINING OF STEELS, CAST IRON, BRASS, BRONZE, ALUMINUM AND NON-METALLICS

★ METRO Standard Tools are tipped with general purpose grades for "UNIVERSAL" shop use in a majority of turning, facing, boring, and forming operations.

Ask for METRO'S new folder on standard carbide tools. Be sure, too, you have a copy of Catalog No. 101 . . complete data on all METRO PRECISION TOOLS and GAGES.

Special carbide-tipped tools to your prints is a METRO specialty. Let our engineers help solve tough machining problems.

Available
RIGHT OR LEFT HAND

METRO

TOOL AND GAGE CO.

4240 PETERSON AVE.
CHICAGO, ILL.

SOUTH BEND LATHES

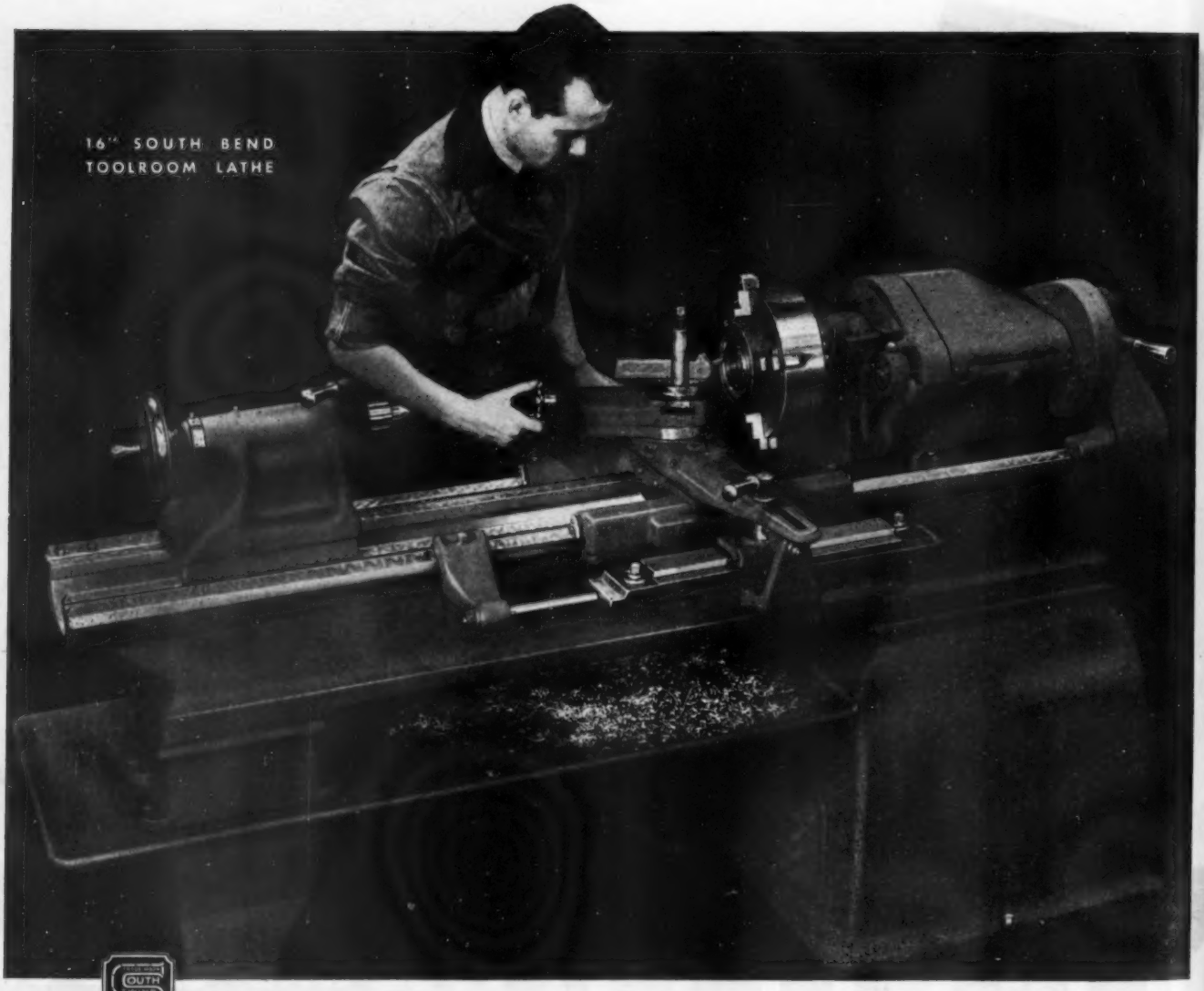
GIVE SKILLED MANPOWER MORE PRODUCING POWER

BUY
WAR
BONDS

To give our fighting forces the increased striking power of more and better weapons, Industry's skilled manpower must have the increased producing power of fast, accurate tools.

South Bend Lathes squarely meet this requirement. Their rigidity and wide range of spindle speeds permit taking full advantage of the higher cutting speeds that are possible with carbide and diamond tipped tools. Their precision makes it possible to finish turn and bore with such accuracy that subsequent grinding and honing operations can often be eliminated.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes—9″ to 16″ swings. The Turret Lathes are made in two sizes—Series 900 and Series 1000. Write for a catalog.



SOUTH BEND LATHE WORKS

SOUTH BEND, INDIANA • LATHE BUILDERS FOR 36 YEARS

P&J AUTOMATIC CHUCKING EQUIPMENT

is on War Production's "front lines"

P & J's service to the war effort in turning out equipment for producing duplicate parts for airplanes, tanks, mobile equipment, guns, shells and other essential products, is a continuous performance. Along with it goes the constant alertness of P & J engineers in developing new methods of tooling which achieve better and better production performance. Case after case is on record where the once considered impossible in speed and time has been achieved. We hope some day to be able to publish the results of what P & J "Know-how" has meant on war production's front lines and what it promises for the future as a means of cutting costs on a wide range of work.

All our facilities and efforts are available to help you solve your immediate problems — NOW!

The POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

Give the Axis a rough finish in shortest possible time . . . by BUYING MORE BONDS NOW!

COURTESY OF U. S. NAVY RECRUITING BUREAU

COLLETS *with Character*

A RIVETT DRAW-IN COLLET has personality derived from a worthy inheritance and a steadily improved environment. Today when a RIVETT COLLET is shipped in its distinctive carton it reflects fifty years of experience and the most advanced methods in manufacture and inspection.

RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

RIVETT

RIVETT LATHE & GRINDER, Inc.

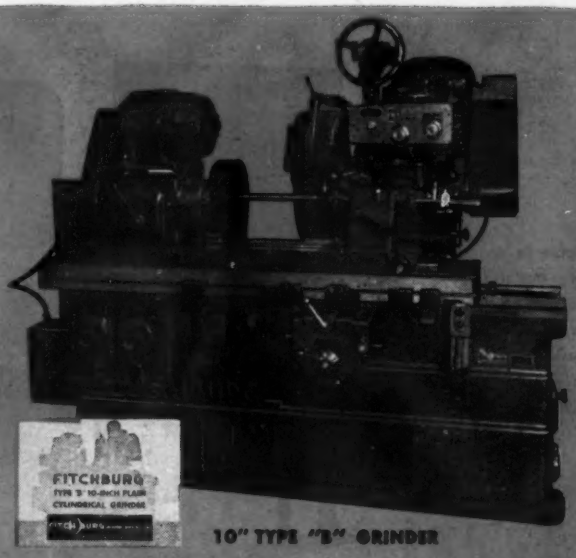
BRIGHTON • BOSTON • MASS. • U. S. A.

FOR GENERAL PURPOSE PLAIN CYLINDRICAL GRINDING . . . FITCHBURG *shows the way to increase production and cut costs*

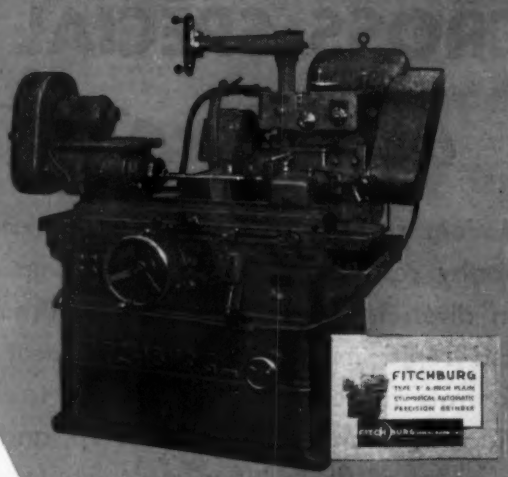
6-Inch Type "B"—The Fitchburg Type "B" 6-inch automatic precision grinder features new engineering principles that result in more economical and faster production of plain cylindrical parts. Made with 18" and 32" maximum capacity between centers.

10-Inch Type "B"—The Fitchburg Type "B" 10-inch plain cylindrical automatic precision grinder also incorporates engineering features that result in more economical and increased work production, greater accuracy, and finer finish. Made with 18", 48" and 72" maximum capacity between centers.

Type "C" Adjustable Angular Head Grinder—The Fitchburg Type "C" Angular Head grinding machine is a single application of the Fitchburg Standard Bowgage Wheelhead Unit. It is designed to handle a wide range and a number of types of jobs. The Bowgage Unit is mounted so that it may be located to grind 0 degrees up to a 45-degree included angle. Prompt deliveries can be made. Mail coupon today.



10" TYPE "B" GRINDER



6" TYPE "B" GRINDER

TYPE "C" ANGULAR HEAD GRINDER

Please mail the catalog checked.

6" Type B ☐ 10" Type B ☐ Angular Head ☐

NAME _____ TITLE _____

COMPANY _____

STREET _____ STATE _____

CITY _____ A. M.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

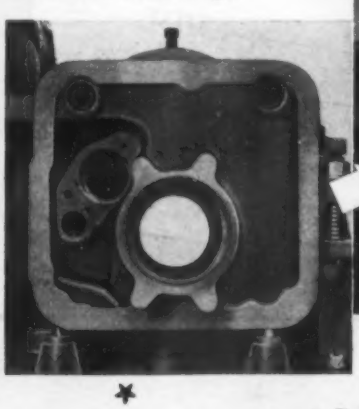
Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

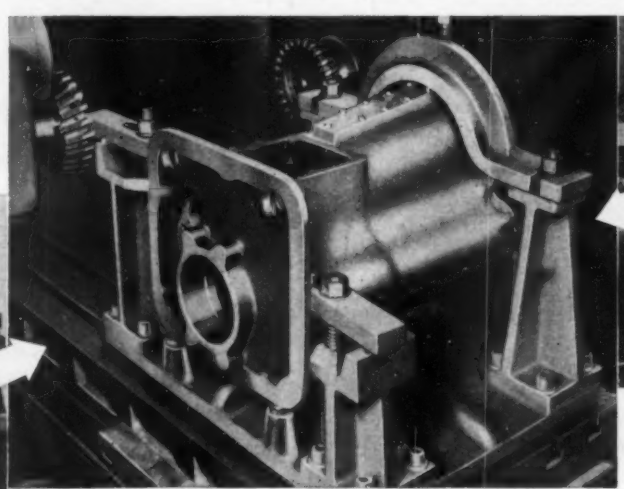
Available in combinations including: any width and length of table and bed, one or more side columns and heads, cross rail with one or more heads containing vertical or angular spindles.

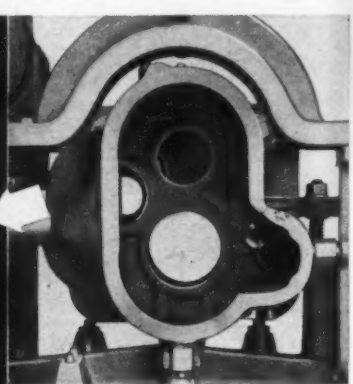
CROSS SPECIAL *Automatic Duplex Miller*

Modern production shops are achieving noteworthy results with the Cross Automatic Miller on diversified classes of work. Hydraulic feed and rapid traverse, with independent electric controls for each head and the table, provide a means for quick set-up and assure a range of flexibility to meet the most exacting requirements. Each head is a self-contained unit with individual motor drive, quill adjustment for the cutter spindle and pick-off gears for changing cutter speeds. The automatic operating cycle is an important contributing factor in maintaining volume production schedules with unskilled help.

One cutter finishes the irregular profile of the large flange, on the left end of the case, as illustrated below. Note the necessity of finishing between the stud bosses of the smaller flange.







A second cutter finishes the irregular profile of the flange on the right end of the case, as illustrated above.

On the cast iron gear box illustrated above—both ends, each entirely different than the other, are automatically finished at the same time and in one operation with the Cross Duplex Miller.

CROSS GEAR & MACHINE CO.

Established in 1898

DETROIT, MICHIGAN, U.S.A.

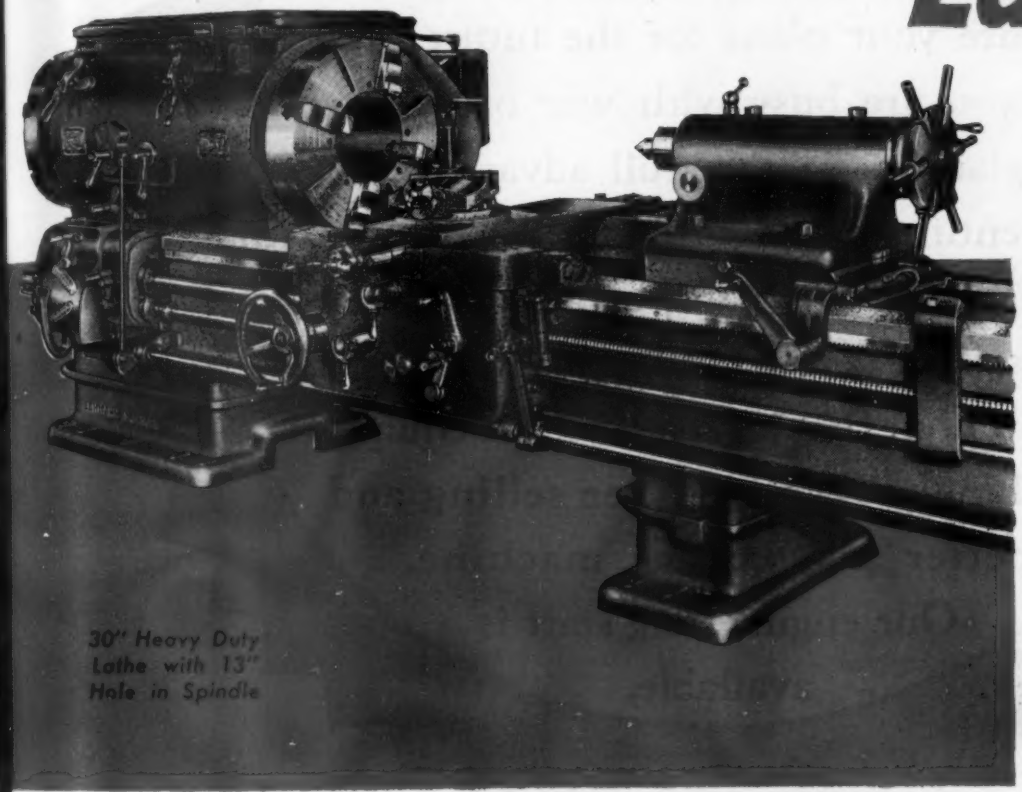
S3

Speed War Production-Improve Work

WITH

HYDRATROL *Lathes*

LARGE HOLLOW SPINDLE TYPE



30" Heavy Duty Lathe with 13" Hole in Spindle

LARGE SELECTION OF SIZES

Provide Wide Range of Usefulness and Efficiency

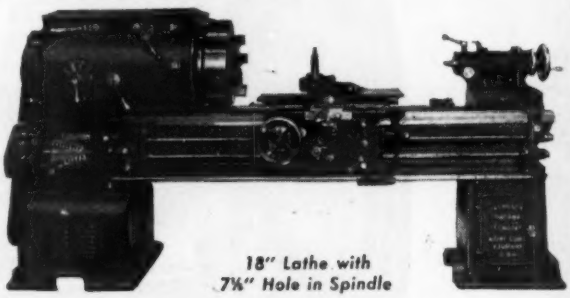
SMALL
18"—Up to 7¼" Hole

MEDIUM
24"—Up to 12" Hole

LARGE
27"—Up to 13" Hole
30"—Up to 14" Hole
36"—Up to 16½" Hole

Check these 8 Distinctive Features

- Easy, Fast, Simple Operation.
- Hydraulic Brakes and Clutches.
- Absence of Mechanical Troubles.
- Automatic and Ample Lubrication.
- Essential Operating Information Automatically Presented (on all Standard Models).
- Mechanism Protected by Automatic Control.
- Extraordinary Hardness of Bed.
- Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and with Beds on both ends of Headstock.



18" Lathe with 7¼" Hole in Spindle

Lehmann

MACHINE COMPANY

CHOUTEAU AT GRAND ★ SAINT LOUIS (3) MISSOURI

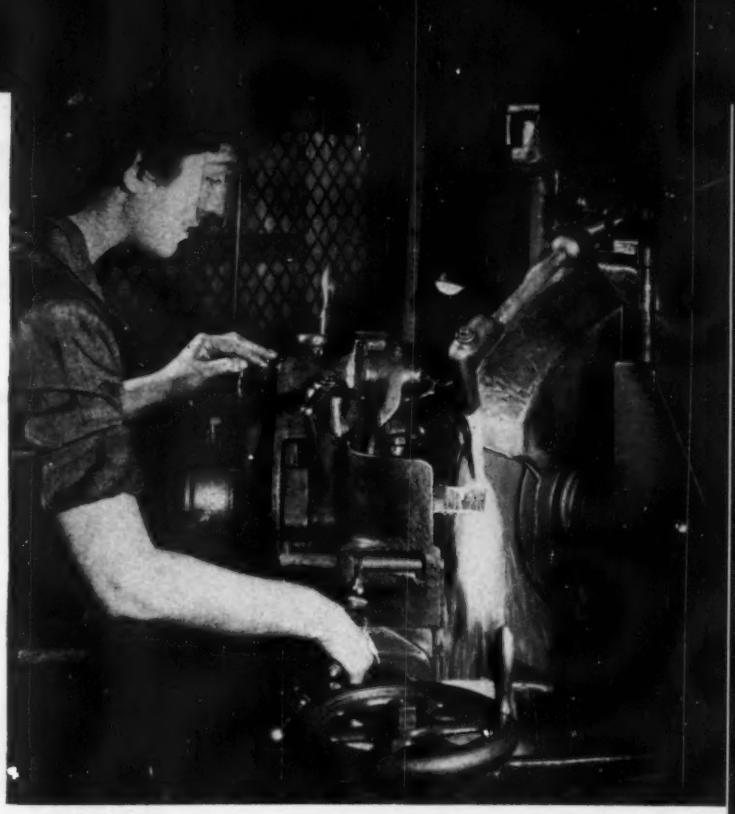
When peace comes the lessons of destruction will be translated into machines for production with startling swiftness. What are your plans for the future? Even though you are busy with war orders today, are you planning to take full advantage of the latest scientific developments? Refinements in machine design invariably mean more Timken Bearings. True, a few Timken Bearings are better than none, but a fully Timken-equipped machine is both a better selling and better performing machine. Our engineering staff is available.

Tapered Roller
TIMKEN BEARING
EQUIPPED

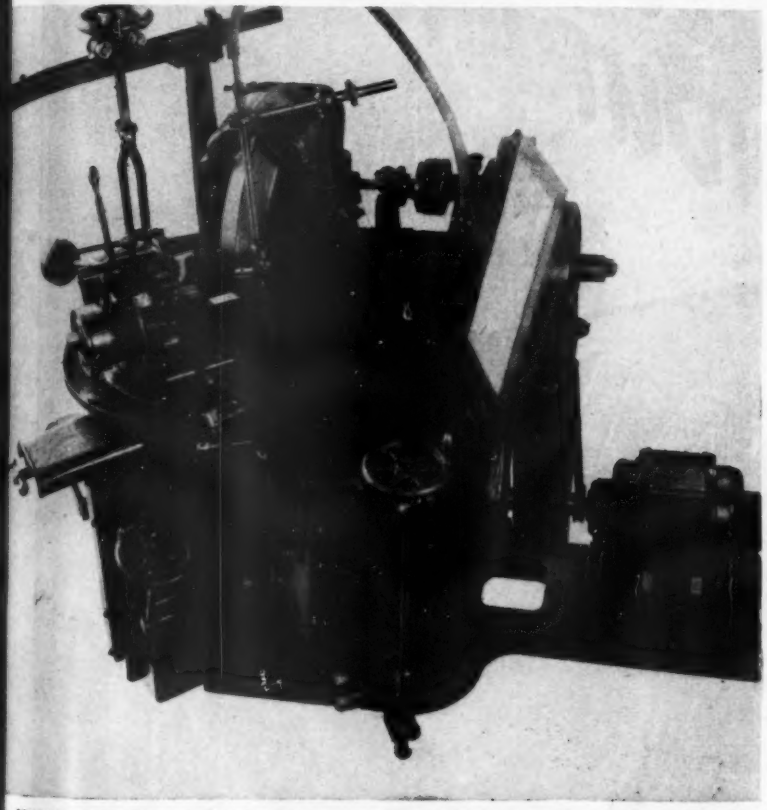
A symbol of quality for any piece of equipment with which it is associated.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

ILLUSTRATED is the Sellers Heavy Duty Tool Grinder Model 6T operated daily by a young girl of average intelligence and normal strength. The simplicity of this big machine and the accuracy with which it automatically grinds cutting tools even of cemented carbide or high-speed steel, make this operator's work compare most favorably with that of the man whose place she has taken for the duration.



SELLERS TOOL GRINDERS DO DOUBLE DUTY



SELLERS HEAVY DUTY TOOL GRINDING MACHINE SHOWING CENTRALIZED CONTROLS

THE SELLERS Heavy Duty Tool Grinder is a versatile, high production precision grinding machine for the modern tool room. It will grind any cemented carbide or high-speed steel, straight or convex, curved faced tools, including thread tools, at any angle of thread or pitch, internal or external, and will accurately reproduce the desired angles and clearances on all the tools. It effects savings in tools by removing the minimum amount of tool material, in production costs, by producing the exact shapes required to maintain high cutting speeds and in grinding time, by more rapid shaping and sharpening.

The simplicity of even the heaviest of the Sellers Tool Grinders and the accuracy with which it reproduces the exact shape, rake, and clearance angle at the cutting edge make it possible for women operators to keep up with the requirements of the busiest tool room, thus releasing men for skilled machine work or for the armed forces.

Sellers Tool Grinders are thus doing double duty on the production front.

WILLIAM SELLERS & CO., INC.,
1610 HAMILTON STREET, PHILADELPHIA, 30, PA.

Sellers

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

U. S. A.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building

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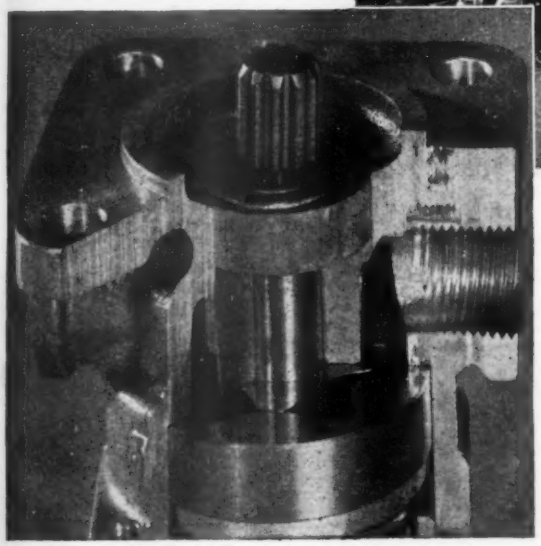
LINES BEHIND THE LINES

"PLENTY! RIGHT NOW!" IS THE AIRCRAFT INDUSTRY'S SLOGAN —FROM PRODUCTION LINES TO FIRING LINES WITH SPEED!

Confronted with the necessity of mass production, the aircraft industry quickly sought and quickly found new methods to machine precision parts at a production rate. Broaching is becoming more and more aviation's way of meeting split second schedules. Broaching — a better way to do many metal working jobs — is the only *right* way to do some!



Cutaway view of Eaton aircraft fuel pump shows distinctive rotor principle, depending for efficiency on accurate fitting.

Teeth in outer rotor are broached on a standard American hydraulic broaching machine. American broaching tools, designed specifically for the task, provide high output at economical cost. American's *complete* broaching service—machines, tools, and engineering — makes war production more efficient, post-war production more profitable.

BROACHING IS BETTER THE *American* WAY

American
BROACH AND MACHINE CO.

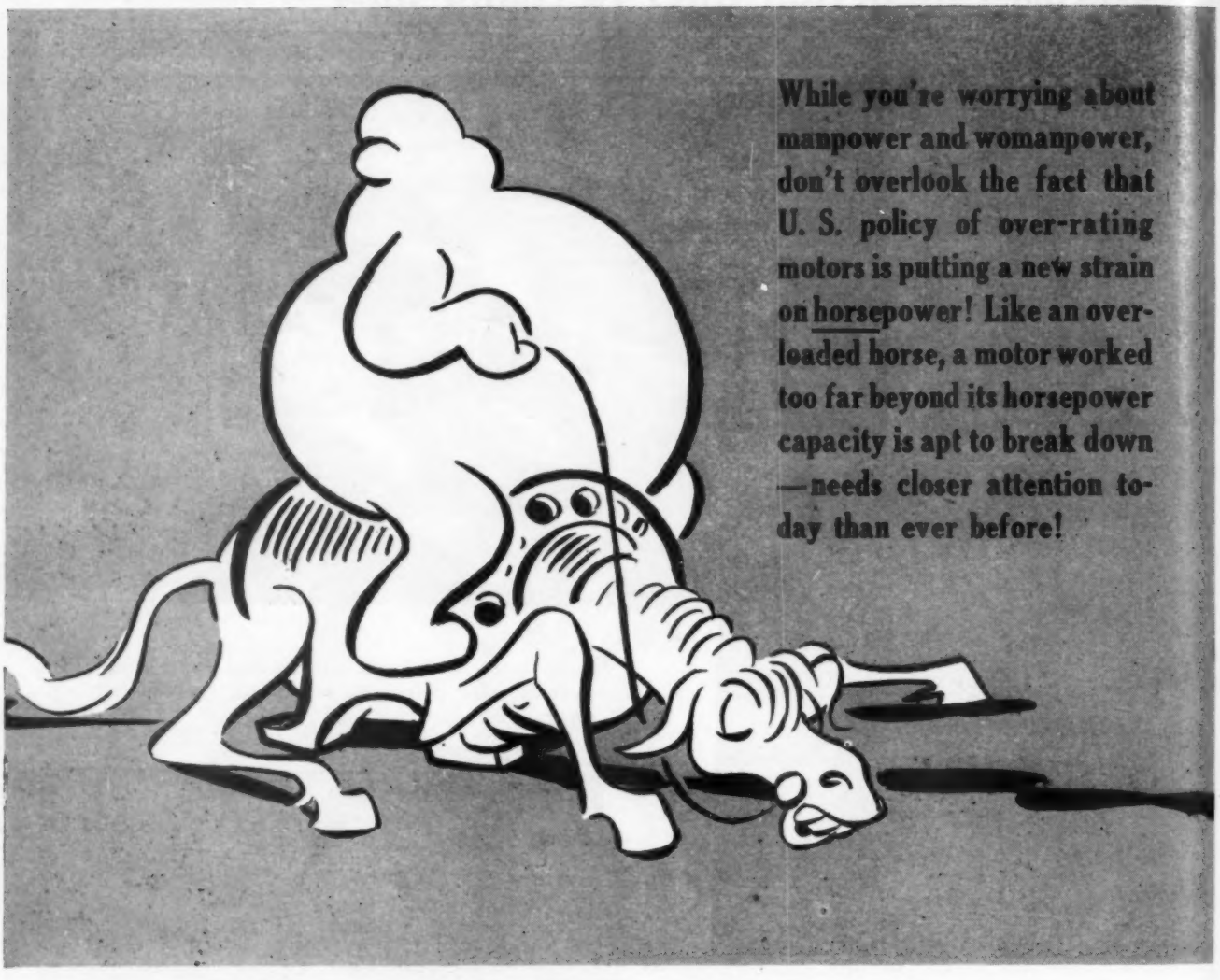
ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS U.S.A.

DON'T FORGET HORSEPOWER!



While you're worrying about manpower and womanpower, don't overlook the fact that U. S. policy of over-rating motors is putting a new strain on horsepower! Like an overloaded horse, a motor worked too far beyond its horsepower capacity is apt to break down—needs closer attention today than ever before!

WHAT WAS GOOD motor maintenance in peacetime, just isn't good enough today! Many motors are working *3 and 4 times* as many hours a week today . . . need wartime care . . . the kind set forth in Allis-Chalmers' new "Guide to Wartime Care of Electric Motors." This interesting, *fully illustrated* book looks at motor maintenance from a *new* perspective . . . describes in detail the 9 main enemies of motor life . . . tells you where to look for them, how to fight them. To experienced men it will serve as a valuable "refresher" . . . to new employees, as a *valuable training course.*

Over 100,000 copies are in use by the armed forces and war industry. World-wide demand has necessitated Spanish and Portuguese editions! "Guide to Wartime Care of Electric Motors" is *free!* Write for your copy. ALLIS-CHALMERS, MILWAUKEE 1, WIS. A 1639

ALLIS-CHALMERS MOTORS

When you do need new motors, look into the strength, solidity and all-around protection of the new "Safety Circle"—protected top, sides, ends and bottom

AC WE WORK FOR VICTORY WE PLAN FOR PEACE

For PRECISION THREADS *on a* PRODUCTION BASIS . . .

Put it on a LEES-BRADNER LT THREAD MILLER

● On precision threads for airplane parts, on accurately threaded work for the army and on close tolerance navy assignments, Lees-Bradner LT Thread Millers are maintaining rigid tolerances in many cases with relatively unskilled labor.

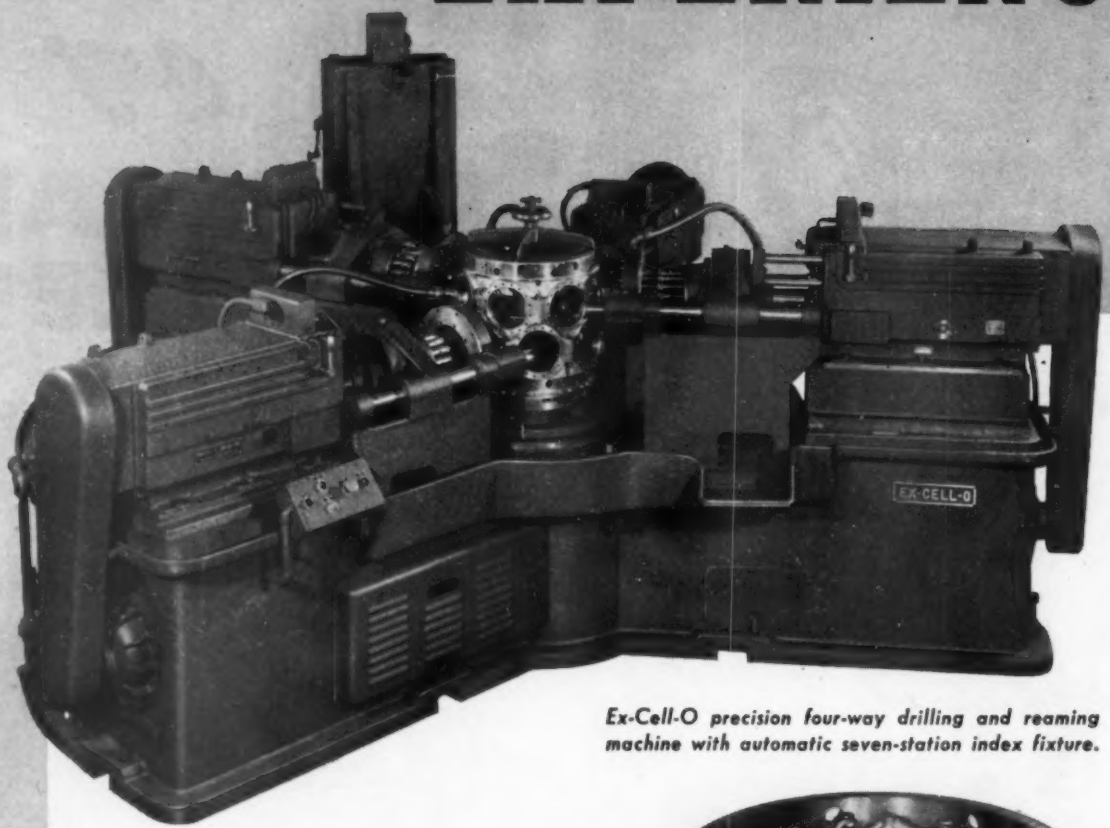
If your job is six inch maximum diameter or under — if it requires either external or internal precision threads—put it on a Lees-Bradner L T Thread Miller.

Why not consult LEES-BRADNER Engineers on YOUR precision threading requirements?

The LEES-BRADNER *Company*

CLEVELAND 11, OHIO, U.S.A.

EXPERIENCE



Ex-Cell-O precision four-way drilling and reaming machine with automatic seven-station index fixture.

★

TYPICAL EX-CELL-O OPERATION

On the above Ex-Cell-O special-purpose machine, aircraft crankcase sub-assembly of aluminum alloy is *precision* machined automatically except for loading and unloading. Part is loaded from top over center post to assure rigidity. "Start Cycle" button is pressed, and machine drills, reams, spotfaces and chamfers 16 stud holes in each of 14 deck pads (total of 224 holes, two operations per hole), then stops, ready for operator to unload and repeat the cycle. This part was formerly machined one bank at a time. Now, with this Ex-Cell-O machine, handling and operation time is exactly one-half what it was; error between banks of holes, radially and vertically (due to reloading of part), is eliminated; also, by one machine only now being required for the job, floor space is reduced.

Increased production attained in precision machining of this aircraft crankcase on Ex-Cell-O special-purpose machine.

PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • TOOL GRINDERS • GRINDING SPINDLES

. . . no substitute for it!

Ex-Cell-O's wide experience in designing and building special machines to increase output and lower costs assures you practical advantages in your immediate or near future production

• You have a substantial background of experience to draw from when you bring to Ex-Cell-O your problem in the *precision* machining of metal parts on a high production basis . . . whether it concerns an immediate war production job or a future product you are now planning. The more economical production of accurate metal parts necessitates single-purpose machines of improved efficiency, capable of giving greater output and reducing unit cost. For years Ex-Cell-O has been an acknowledged leader in the field of special-purpose machines . . . *precision* machines with exclusive features that represent the utmost in accuracy, production, operating ease, rigidity, and durability. Every special machine manufactured by Ex-Cell-O is designed to give the most practical results on the job for which it is built — improvement in the quality of the work, direct savings in both time and money, and maximum service and life in the machine itself.

This is why you should utilize Ex-Cell-O's experienced engineering and manufacturing facilities. Ex-Cell-O has representatives in all of the nation's principal manufacturing centers. Consult the one nearest you, or write to Ex-Cell-O Head Office in Detroit.

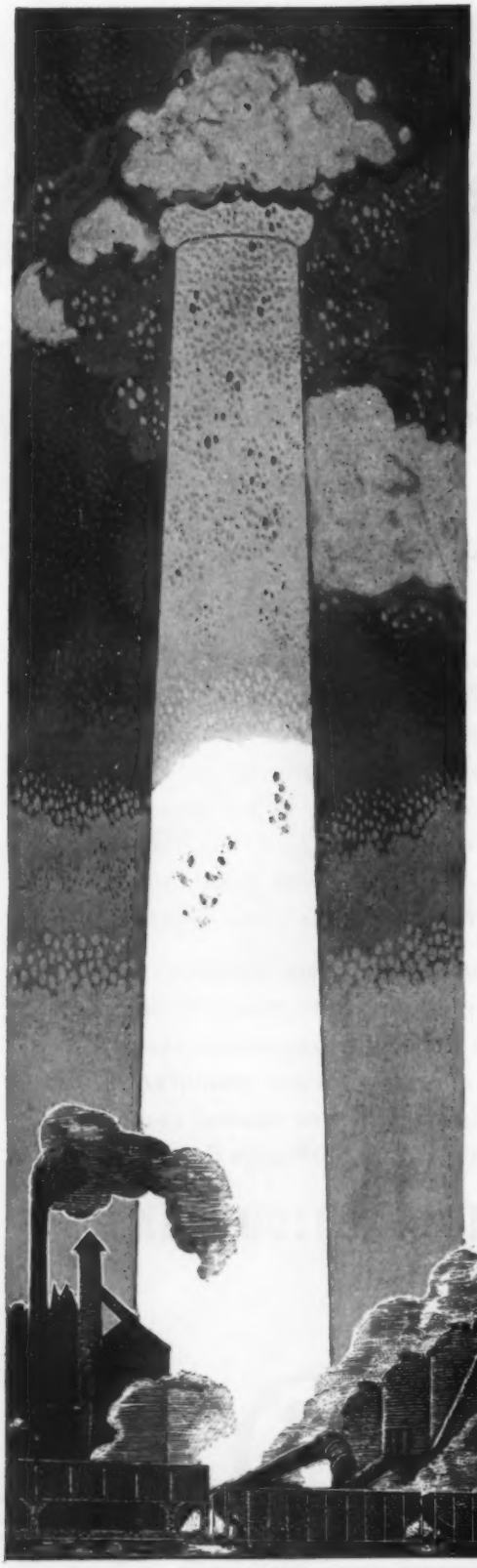
EX-CELL-O CORPORATION • DETROIT 6, MICHIGAN

If you do not now receive Ex-Cell-O TOOL TIPS, devoted to precision and speed in production, send your name, company, address and position to Department of Public Relations, Ex-Cell-O Corporation, 1200 Oakman Boulevard, Detroit 6, Michigan. Current issue of TOOL TIPS (Vol. 18, No. 4) illustrates a variety of special machines designed to meet many modern production problems.

XLO

EX-CELL-O *for* PRECISION

HYDRAULIC POWER UNITS • BROACHES • CONTINENTAL CUTTING TOOLS
DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • PURE-PAK
CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

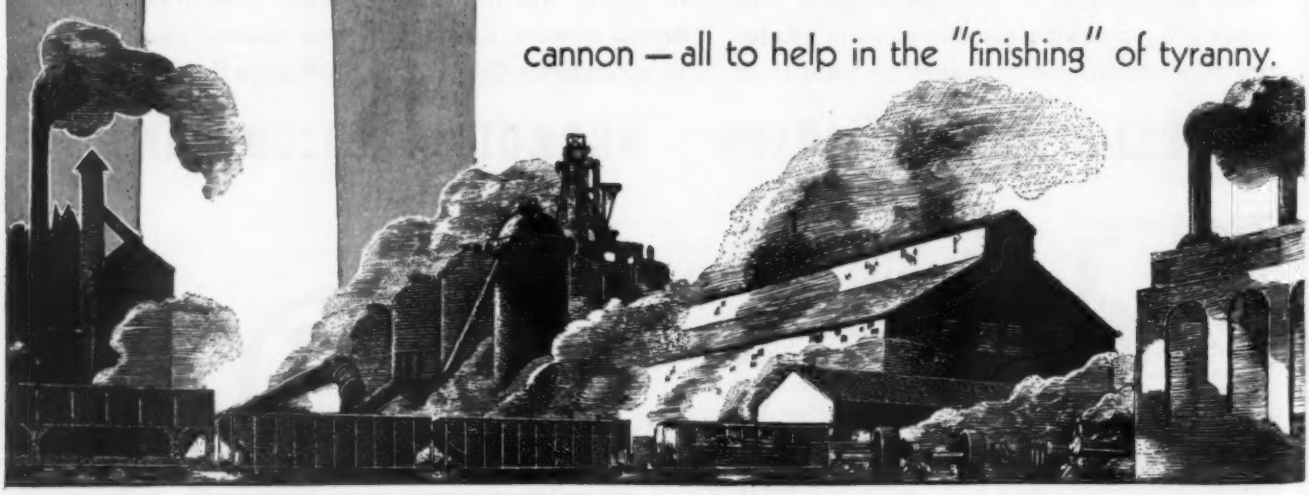


BLACK SOOT

-That is cleansing the world

It isn't pretty, the soot that settles from the blast furnaces, foundries, forges, and power plants that dot the industrial landscapes. This soot is billowing from millions of stacks throughout this continent, and is symbolic of the gigantic job of cleansing the world of barbarism.

Our part is in building steam and diesel engines for ships; heavy machinery on which other war necessities are produced; in finishing cannon — all to help in the "finishing" of tyranny.



GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

Announcing

NEW

BUYING DATA

THAT REDUCES MOTOR AND CONTROL SELECTION AND ORDERING TIME 1/2

Westinghouse takes pride in introducing new, simplified Buying Data, which enables you to select and purchase the proper motor and control for your job—in one-half the time!

Data, as presented, is striking in its newness. It's easier to read, easier to understand, and easier to use than any offered previously by any manufacturer.

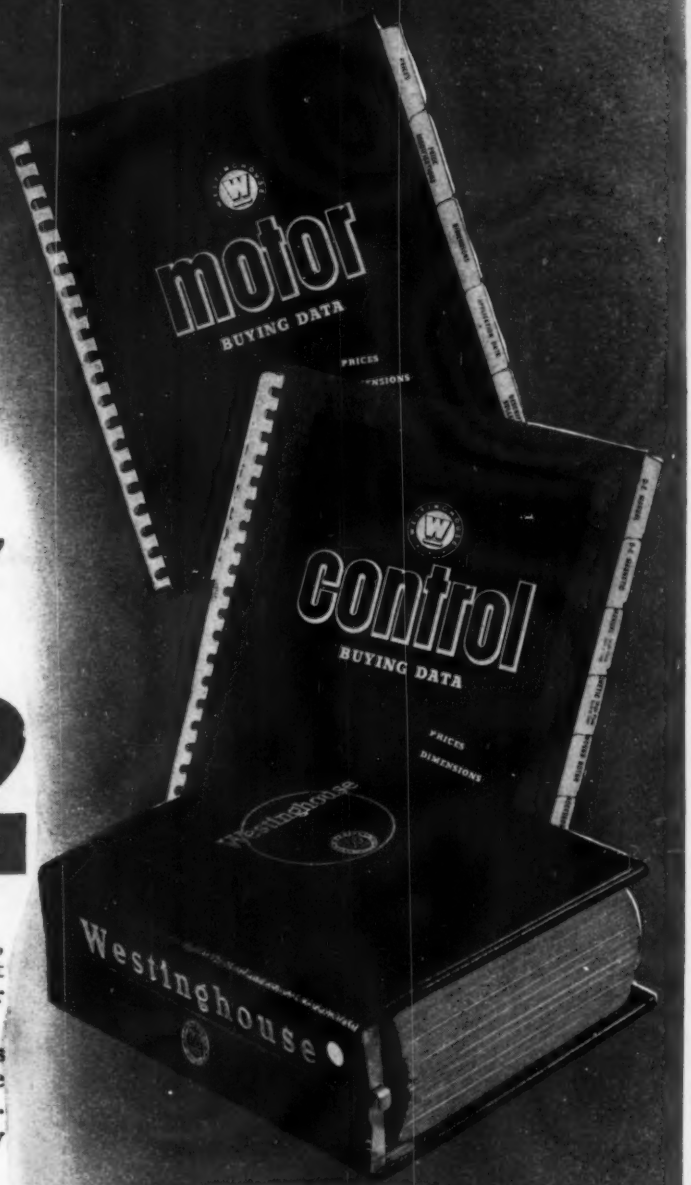
To fit widely varying requirements, this radically new Buying Data is available in two forms:

- **Bound books** are suitable for use of the majority of motor and control buyers. They contain prices (correct at time of issue and satisfactory for estimating purposes throughout the books' life), dimensions, application data and descriptions. They include the following:

  "Motor Buying Data" covers popular types and ratings of Motors (up to 100 hp), Gearmotors and M-G Sets.

  "Control Buying Data" lists a wide variety of controllers and accessories for direct current, single-phase, squirrel-cage and wound rotor motors.

- **Motor and Control Loose-Leaf Book.** This is for the use of large-scale purchasers and is "tailored" to meet the needs of the individual buyer. Pricing data is always kept up to date by the issuance of new price supplements.



SIMPLIFIED

FOR QUICKER SELECTION . . . EASIER ORDERING . . . QUICKER DELIVERY

HERE'S HOW TO GET THIS NEW BUYING DATA

If you are a buyer of Motors and Control, chances are you have already received this new data by mail.

However, if you have not received your copy, write, wire or phone your nearest Westinghouse district office (distribution will be made through district offices only—no mailings from Westinghouse Headquarters at East Pittsburgh). Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

J-90485

Westinghouse *Motors and Control*

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

He Never Has to Take His Eyes Off the Cutter and Work

DEVLIEG JIGMIL

Spindle start, stop and reverse—

Power vertical feed and rapid traverse movement—

Power horizontal feed and rapid traverse movement—

Power automatic table retraction and repositioning—

Power feed and rapid traverse to bar movement—

are all carried in a master switch on the spindle head—at the operator's finger tips.

Thus, the operator of the DeVlieg Jigmil can fix his vision on the cutter and work—never has to look at controls during operation.

The Jigmil is what a machine tool should be—a powerful and accurate extension of the operator's hand. The value in precision boring and milling is apparent.

It's a NEW Type Machine

Spacing Accuracy of a Jig Borer . . . Performance Qualities of a Milling Machine . . . Convenience and Flexibility of a Horizontal Boring Mill.

New speed of operation . . . New standards of excellence of bored holes . . . New accuracy in milling . . . Automatic table retraction and repositioning dependable within .0002".

Many machines show 75% greater average daily productivity.

Write for Circular

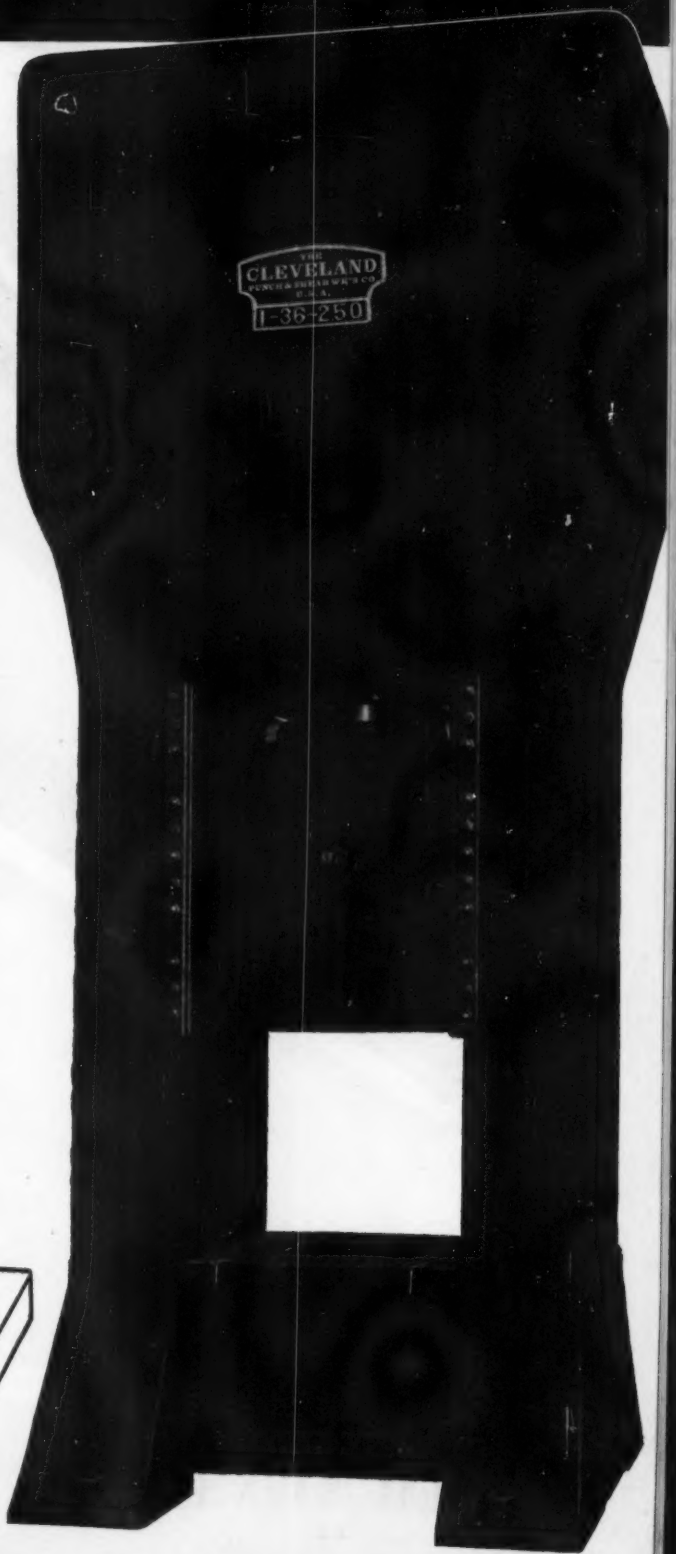
DEVLIEG MACHINE TOOLS

DE VLIEG MACHINE COMPANY

450 FAIR AVENUE, FERNDALE (DETROIT), MICHIGAN

MODERN CLEVELAND PRESSES

SINGLE POINT



THIS illustration shows a Cleveland Single Point Press which has one connection located in the center of the slide.

The Press is single geared with twin drive to the shaft and the gearing, which runs in a bath of oil, is located in the box type crown together with the drive unit.

This arrangement of the gears and drive unit is similar to that of the Two Point and Four Point Press and eliminates all overhanging brackets or other projections, thereby conserving valuable floor space.

The Press is arranged with an electrically controlled, pneumatically operated friction clutch and brake but, as with all other Presses of this series, a hydraulically operated clutch can be furnished, if desired.

This 1-36-250 Cleveland Single Point Press exerts a pressure of 250 tons, has a bed area 42" x 36", a stroke of 12" and operates at the rate of 30 strokes per minute.

However, Cleveland Single Point Presses can be furnished in sizes and capacities to suit requirements.

THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

CADILLAC
Thread Plug
GAGES

CADILLAC THREAD GAGES

National Fine
National Coarse
0-80 to 1½-6

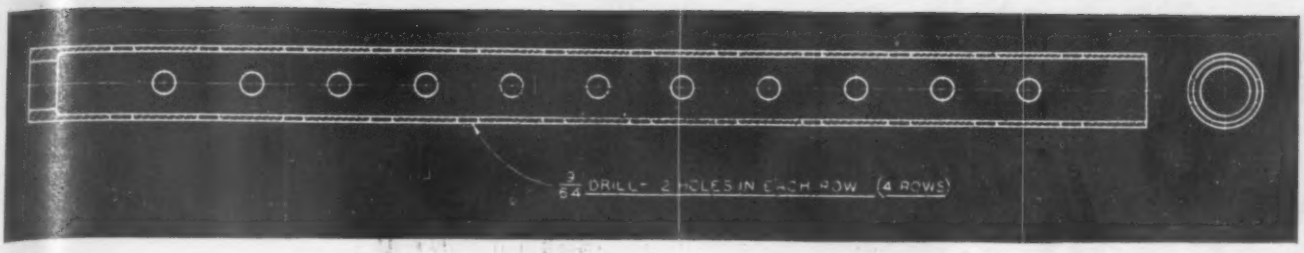
CADILLAC GAGE COMPANY
Detroit

ALL READY TO SHIP! Standard thread plug gages in sizes 0 - 80 to 1½ - 6, National Fine or National Coarse — also pipe plug gages ⅛ to 1¼.

With a plant equipped with the most modern facilities, and devoted exclusively to the manufacture of thread plug and ring gages, we are able to maintain an exceptionally complete range of sizes to fill rush orders for any normal quantity.

The name CADILLAC is recognized far and wide as a hallmark of quality in its particular field. In accuracy and finish, Cadillac Gages are second to none.

Send us an order covering your immediate requirements. If you must have overnight shipment, wire us.



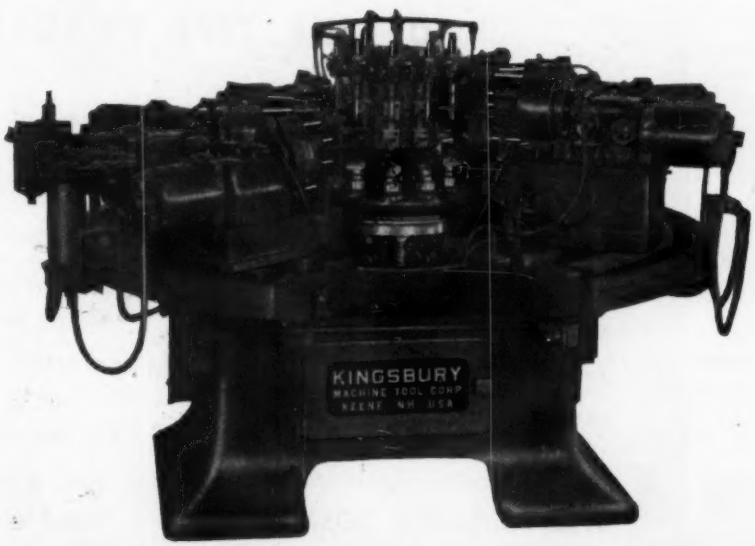
A FLEXIMATIC

by KINGSBURY

JOB ... SPEEDING NAVAL ORDNANCE PRODUCTION!

When the call came for machines capable of turning out munitions and aircraft parts at mass-production speeds, Kingsbury FLEXIMATICS were ready! Quickly made up of standard units mounted on standard bases. FLEXIMATICS can perform drilling, tapping, reaming and many other operations in **any** position or at **any** angle on **any** part that can be chucked. For example, all 48 holes are produced in the flash tube shown above in a single chucking of the work. Each work holder on the main turret is in itself a turret which indexes as the main turret indexes, thus enabling the rows of holes to be drilled at four positions on the tube without removing the work. Various lengths of tube can be handled by the machine by adjusting the position of the top clamping member.

Speeding war production by making it possible for semi-skilled labor to turn out large volumes of precision parts, Kingsbury FLEXIMATICS possess the added advantage of FLEXIBILITY that permits quick, easy changeovers to meet changes in design or machining requirements.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

THAT'S THE RECORD SET BY A MID-WEST "B" BOND GRINDING WHEEL OF THE TYPE PICTURED HERE

The "38 hour" wheel is a MID-WEST "B" BOND WHEEL, Type 5, 7.80, JB5, sized 10 x 2 x 2 and recessed on one side. It was installed on an Ex-Cell-O dry grinder by a large munitions plant in New Jersey and was being used to sharpen cemented carbide tool tips.

In a report submitted to the MID-WEST ABRASIVE COMPANY, engineers of the New Jersey plant said:

"This wheel lasted for 38 hours of continuous grinding. Best wheel ever used on this job. The wheel held its shape and required considerably less dressing."

For faster, more efficient carbide tool grinding order MID-WEST "B" Bond wheels today!

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. MILWAUKEE AVENUE DETROIT 11, MICH.

The Boy Who Worked "by the Book" *equaled the expert's time*

IT WAS A BIG, busy war plant. One of the toolmakers died, left his jig borer standing idle. And he was a crack man . . . an old-line craftsman who didn't take *anything* for granted, and turned out first-rate work with the earnest help of his Pratt & Whitney machine . . . not fast, but well.

In desperate need of the work that machine could do, the superintendent went out to the toolroom and grabbed off a young fellow who was a good milling machine operator, but who had never handled a jig borer.

"Here," the super said, handing the boy the P&W jig borer instruction book, "study this, and tomorrow I'll put you to work on a bigger job than you've ever had yet."

Now, the super hadn't picked this boy by chance. He knew the lad was a good milling machine operator, and he knew *why* . . . because he followed instructions exactly as he received them, and trusted his machine's accuracy.

The boy tackled the jig borer, one eye on the work and the other on the book. After the first few days, he was able to use both eyes for the work. After a month, he was turning out the same production the expert toolmaker had achieved.

Two important facts are established by this true story. One, the accuracy is there, in the P&W Jig Borer, ready to be put to work by *any* conscientious operator. The expert had done his job well, but his extra skill could have been used better on work that only an expert can do. The boy, by taking full advantage of the P&W Jig Borer's built in accuracy, became a good operator quickly. This is a profitable lesson in using limited man power and skill.

Secondly, the instruction book that accompanies every Pratt & Whitney machine tool contains the essential facts about the machine . . . the boiled-down, clearly-presented "know-how" of P&W designers, engineers, production men, and machine operators who have been over all this ground before the machine ever reaches your floor.

Trust the Pratt & Whitney machine accuracy . . . read and follow the instructions . . . and you'll get maximum production.

PRATT & WHITNEY
Division Niles-Bement-Pond Company
West Hartford, Connecticut

PRATT & WHITNEY

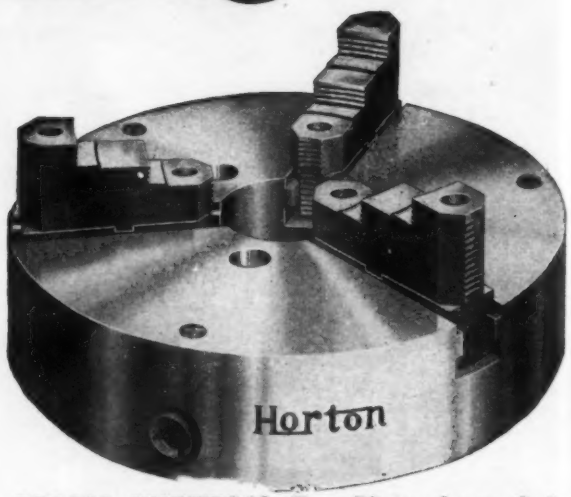
MACHINE TOOLS ★ SMALL TOOLS ★ GAGES

WEST HARTFORD CONNECTICUT

Basic Accuracy for Mass Production

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

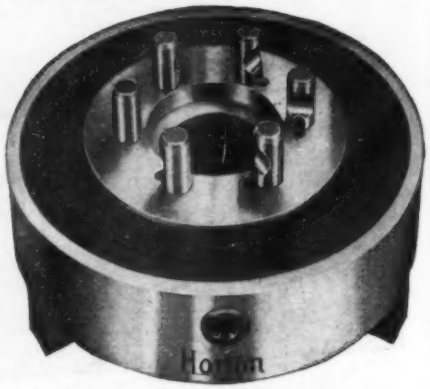


SCROLL UNIVERSAL Two-Piece Jaws Only

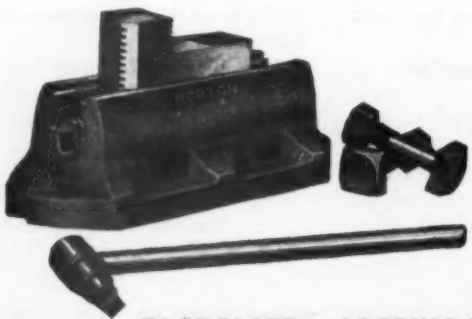
For Use With Intermediate Plates On Threaded Spindles

For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



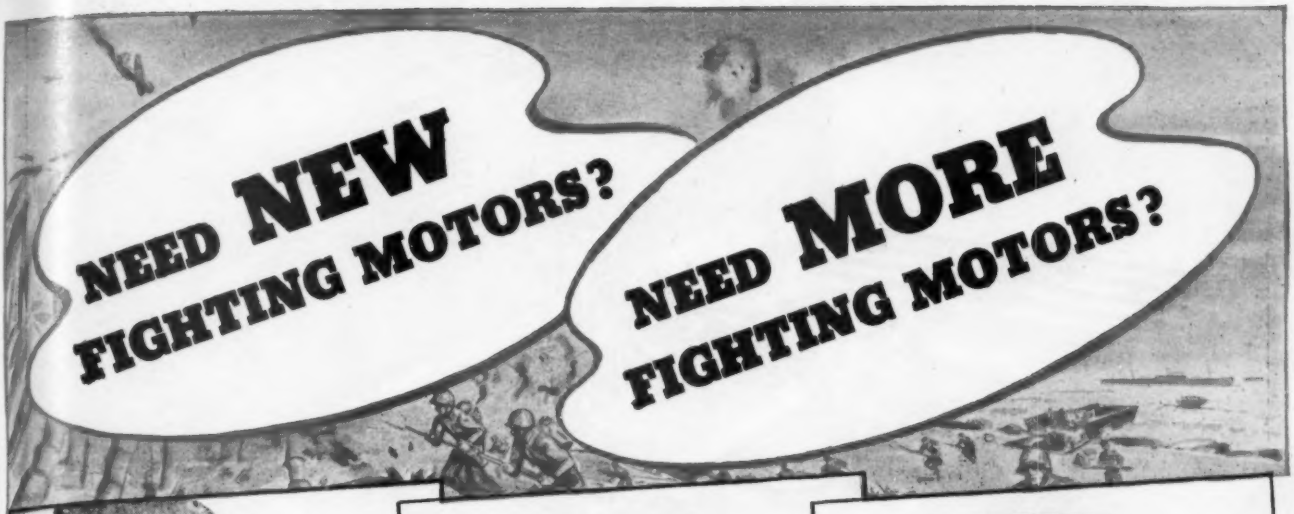
For Flanged Tapered Nose Spindles
Illustration shows Chuck for Type D (Cam Lock) Spindle



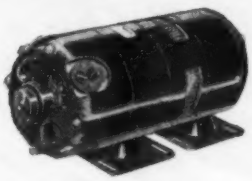
HORTON
MORROW

FACE PLATE and BORING MILL JAWS—Steel Body Only

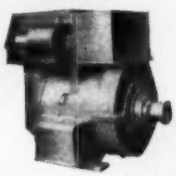
SINCE 1851 .... THE E. HORTON & SON CO.
WINDSOR LOCKS, CONNECTICUT, U. S. A.



1. **TINY BUT VITAL,** this G-E gear-motor for aircraft service weighs only 8 ounces. It provides driving force for protective devices and small controls. Rating: 3 watts, intermittent, at approximately 100 rpm.



2. **DEADLINESS** of our land, sea, and air weapons has been increased—by application of the G-E amplidyne. Along the industrial front this versatile new generator-type amplifier is speeding production.



3. **EFFICIENT COOLING** of this totally enclosed d-c motor is accomplished by an air-to-air surface cooler built on the machine. High output from small frame size is the result.

THIS G-E SERVICE IS MOBILIZED TO HELP YOU

IF THE war machines you build must be equipped with electric motors or generators, G.E. may be able to help you boost your output or motorize your designs in a better way. The important point is to get in touch with us *right at the start* of your planning.

Already, by close teamwork with builders of combat equipment, we have helped to engineer and build scores of ingenious fighting motors—many too secret to show here. Thus, a great fund of G-E experience is "on tap."

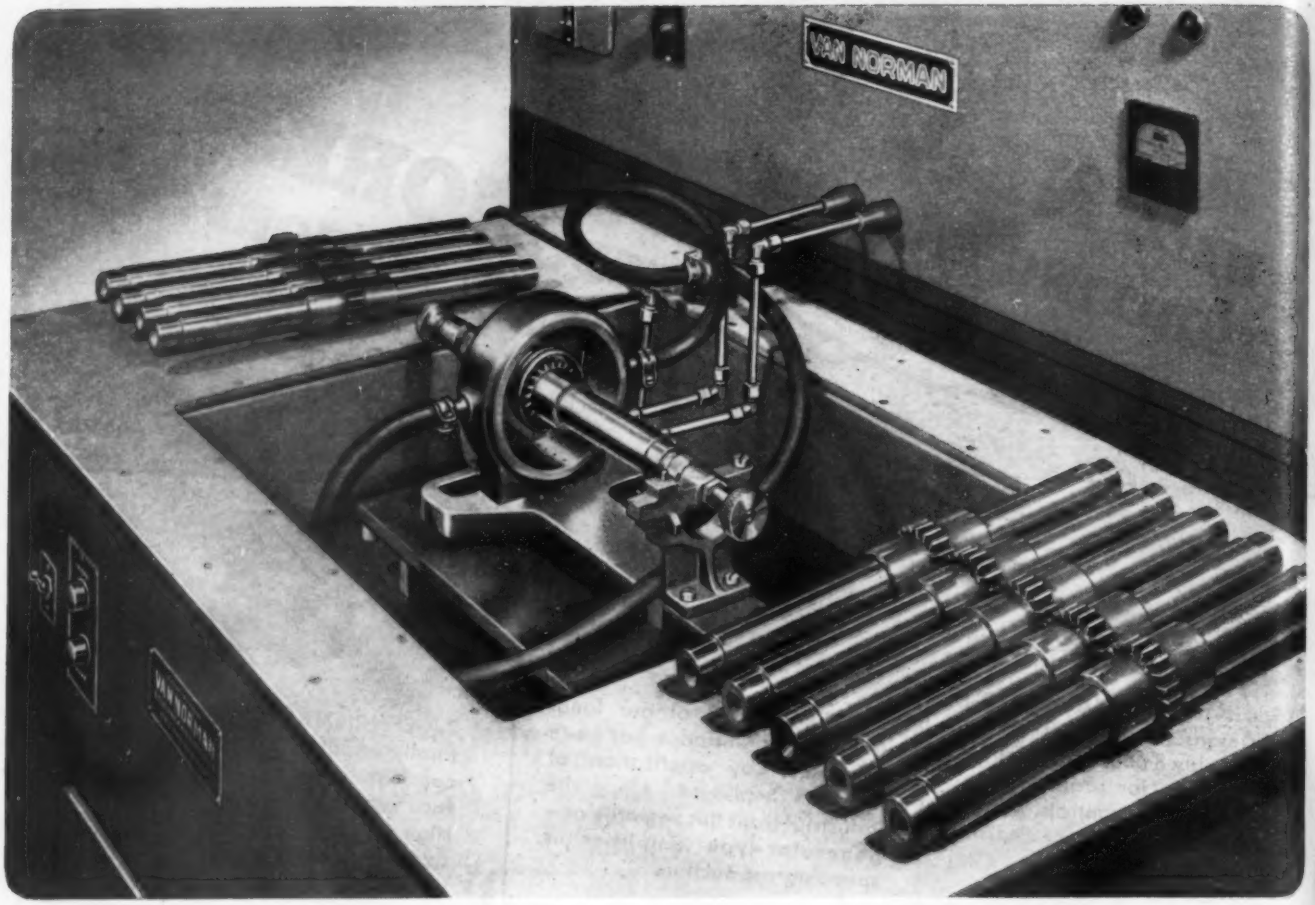
Facilities for further work on fighting motors are now available—not for every type, but possibly for the kind of motor that's right for your job. In any event, we'll give your problem prompt, realistic consideration, telling you frankly just how far and how fast we can serve you.

G-E engineers are helping apply all kinds of fighting motors to all kinds of war equipment. Your local G-E representative will help you take advantage of this service. *General Electric Company, Schenectady, New York.*

GENERAL ELECTRIC

750-215-8030

FIGHTING MOTORS



VAN NORMAN INDUCT-O

HARDENS GEAR MADE INTEGRAL WITH SHAFT IN 16 SECONDS WITH NO DISTORTION OF SHAFT!

Because the Van Norman Induct-O localizes heat in a particular section of a part, it permits surface hardening of individual sections of shafts, cams, etc. without affecting the rest of the workpiece.

For example, the teeth of the 2½" diameter gear made integral with the shaft, illustrated, is hardened to 55 Rockwell C in 16 seconds. The heating time is 10 seconds followed by a 6 second quench.

With the previous heating method, the entire part was heated for hardening the teeth with the result that warpage and distortion of the shaft was often encountered. This called for a costly, troublesome straightening operation. The Van Norman Induct-O, however, localizes heat in the gear teeth only, thus no warpage takes place and the usual straightening operation is eliminated. Obviously Van Normanizing speeds production, cuts costs and reduces work spoilage. If your production calls for hardening, brazing, soldering, annealing, forging or melting, it will pay you to investigate the Van Norman Induct-O high frequency induction heating unit. Write for fully descriptive catalog.

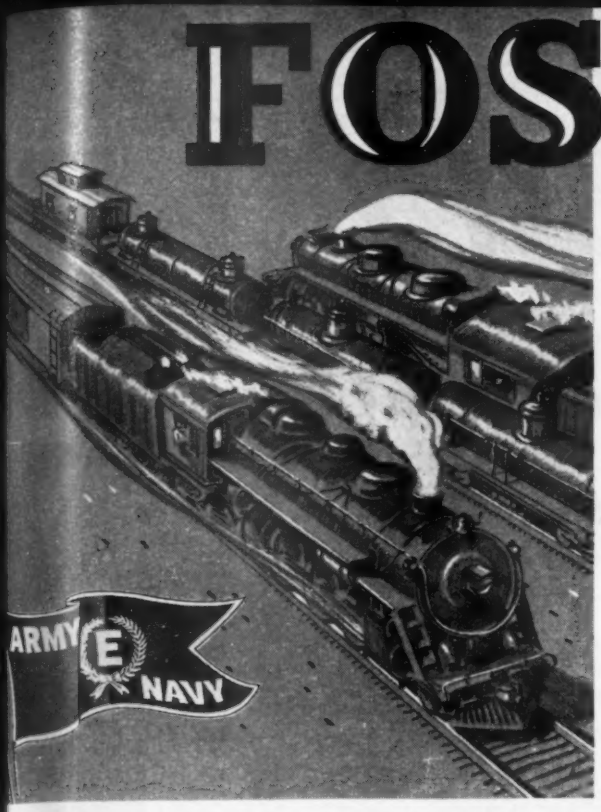
ARMY E NAVY

"It pays to Van Normanize"

VAN NORMAN MACHINE TOOL CO.
ELECTRONICS DIVISION
SPRINGFIELD, MASSACHUSETTS

FOSDICK

Hydraulic Radial



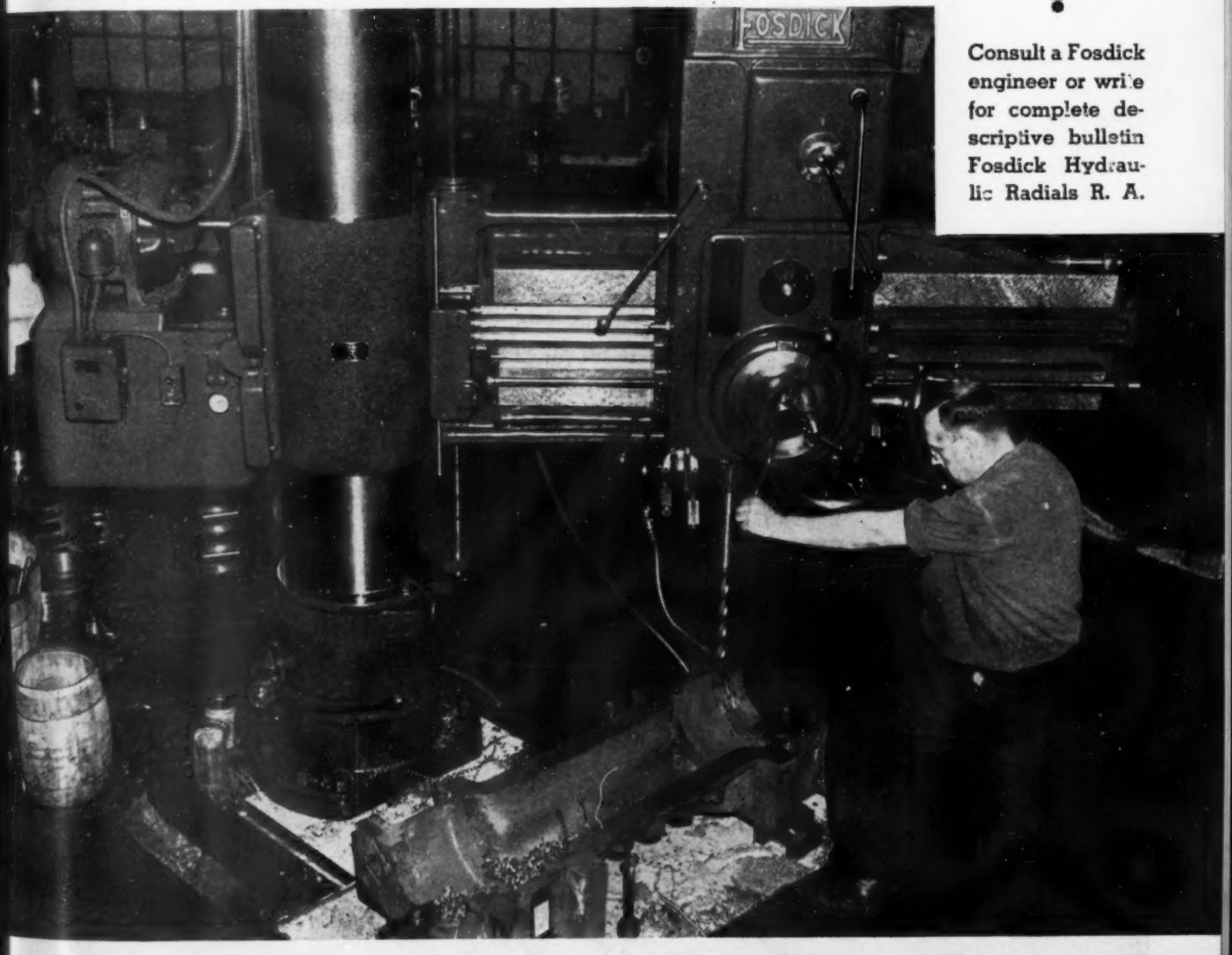
KEEPS VITAL WAR GOODS ROLLING

Now, more than ever, it is essential to keep war materials rolling to our world wide batile fronts. Locomotives form a part of our first line in transporting essential war goods. The Fosdick Radial shown is Drilling and reaming 16 - 1¼" dia. and 8 - 1⅛" dia. holes in locomotive axle housings. All operations are finished in one setting.

For accuracy — high production — and continued economy put your jobs on a Fosdick Economax Hydraulic Radial.

•

Consult a Fosdick engineer or wri'e for complete descriptive bulletin Fosdick Hydraulic Radials R. A.



FOSDICK MACHINE TOOL COMPANY
CINCINNATI ··· OHIO

R.S.V.P.

IF YOU HAVE ANY SURFACE GRINDING PROBLEMS—ANSWER THESE QUESTIONS . . DETACH THE COUPON AND SEND IT TO US

THE BLANCHARD MACHINE COMPANY
SURFACE GRINDING MACHINES
64 STATE ST., CAMBRIDGE, MASS., U.S.A.

Are you machining flat surfaces? Yes ☐ No ☐

Is the machining of hard steel a problem? Yes ☐ No ☐

Are you wasting iron on oversize castings so cutting tools can get under the hard skin? Yes ☐ No ☐

Are your labor and machine costs high due to necessity for performing roughing and finishing operations on separate machines? Yes ☐ No ☐

Are you satisfied with your (a) finish? Yes ☐ No ☐ (b) flatness? Yes ☐ No ☐ (c) parallelism? Yes ☐ No ☐ (d) dimension tolerance? Yes ☐ No ☐

Would you like to produce surfaces to a limit of 5 micro inches? Yes ☐ No ☐

Are your lapping operations long and expensive? Yes ☐ No ☐

Is your production rate on flat surfaces equal to the best that can be found elsewhere? Yes ☐ No ☐

Will you allow our representative to call and discuss Blanchardized surfaces and how Blanchard Vertical Grinders can serve you? Yes ☐ No ☐

Our booklet, Work Done on the Blanchard, is free for the asking. It may point the way to economies in your manufacturing department. Would you like a copy? Yes ☐ No ☐

Further comments .....

.....

.....

Name ..... *Position* .....

Company .....

Address ..... AM

BLANCHARD WORK BOOK

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE, MASS., U. S. A.

STANDARD
Dial Snap Gage

ACCURATE as a Bench Comparator but FAST and PORTABLE!

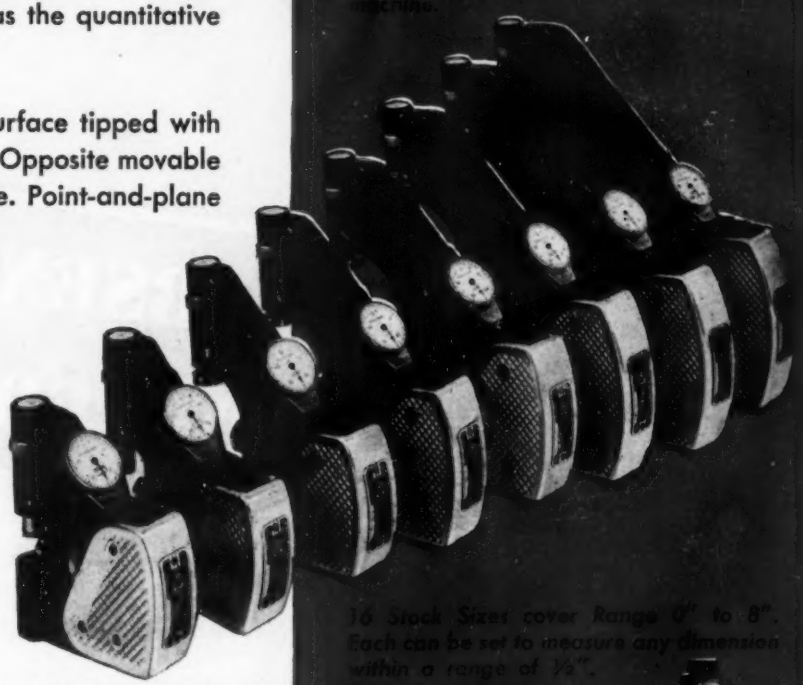
TOP: *High production bench inspection of precision parts.*

BOTTOM: *Precision grinding inspection can be done without removing piece from machine.*

HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically *defies wear*. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.



16 Stock Sizes cover Range 0" to 8". Each can be set to measure any dimension within a range of ½". Sizes measuring up to 4" designed as above. Sizes 4" to 8", because of larger size, are made with convenient finger hole grip for greater ease in handling as shown in illustration at right.

FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.

2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.

3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.

4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.

5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

TOOL ABSENTEEISM REDUCED 66%

SUNICUT

"triples tool life . . . improves finish . . . increases production"

Tool "absentees" can hurt war production just as much as the operator who stays away from his job. One large plant faced with the problem solved it this way.

Every 4 hours time was lost in changing tools . . . regrinding caused production to lag. They called in a Sun Cutting Oil Engineer who studied the problem and recommended a change in cutting oil — to Sunicut 110.

Here are the results. Instead of time out for changing tools every 4 hours they now change them only every 12 hours — a 200% increase in tool life! Sunicut's transparency permits easy inspection of work while machining . . . and a smoother finish is obtained. Because of less "time out" for tool changes production increased 20% . . . and is being stepped up still more since machine speeds have now been increased one-third.

Performance like this is winning Sunicut an outstanding reputation on all operations where a straight, sulphurized cutting oil is used. For longer tool life, better finish, increased production in your plant, call on a Sun Doctor of Industry to analyze your needs and recommend the proper grade of Sunicut today. Write

SUN OIL COMPANY · *Philadelphia*

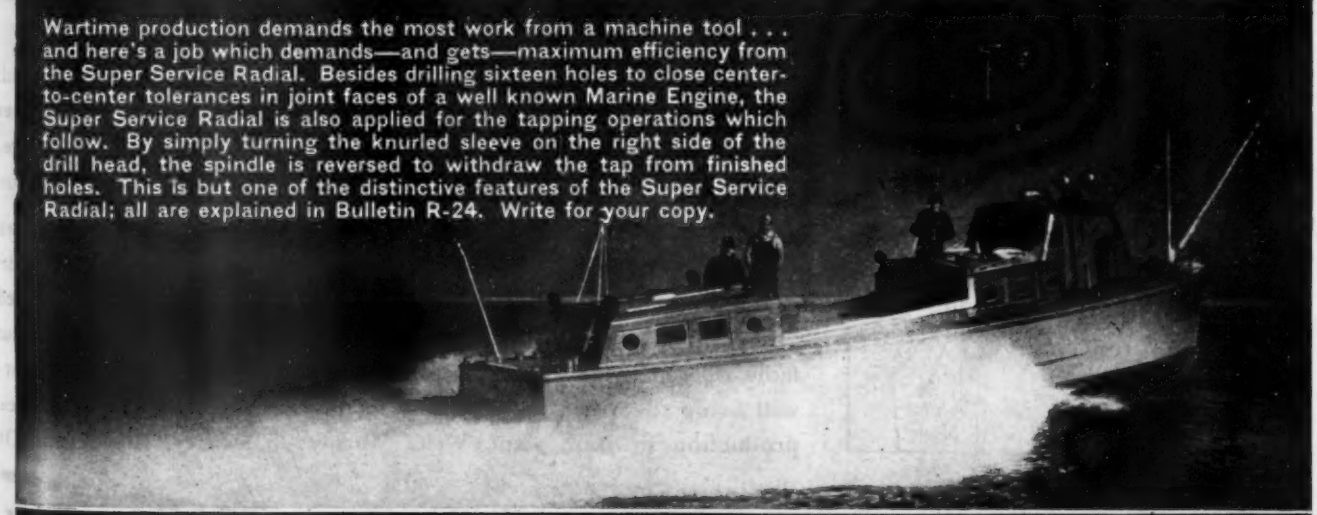
Sun Oil Company, Ltd., Toronto and Montreal, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERIC*

MARINE ENGINE MANIFOLDS
DRILLED and TAPPED WITH A SUPER SERVICE RADIAL

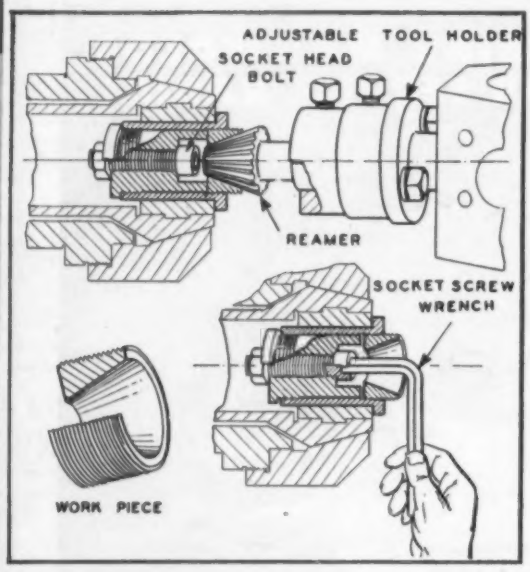
Wartime production demands the most work from a machine tool . . . and here's a job which demands—and gets—maximum efficiency from the Super Service Radial. Besides drilling sixteen holes to close center-to-center tolerances in joint faces of a well known Marine Engine, the Super Service Radial is also applied for the tapping operations which follow. By simply turning the knurled sleeve on the right side of the drill head, the spindle is reversed to withdraw the tap from finished holes. This is but one of the distinctive features of the Super Service Radial; all are explained in Bulletin R-24. Write for your copy.



THE CINCINNATI BICKFORD TOOL CO.

OAKLEY · CINCINNATI · OHIO · U. S. A.

Putting a Movable Backstop in the Jig Solved this Problem



J. D. Bosset, turret lathe operator at the Canadian Vickers, Ltd., Montreal, Canada, was up against a second operation job that presented difficulties. A small threaded piece had to be held in a threaded adapter for taper reaming the bore. The pressure of the reamer so tightened the work piece against the bottom of the jig that it was impossible to screw out the piece after reaming.

Operator Bosset licked the problem by developing a simple holding fixture with a movable backstop. After reaming the piece, a socket wrench inserted through the bore, moves the backstop away from the piece, to relieve the pressure, and permit the finished piece to be easily removed.

A Warner & Swasey "Ideas for Victory" Pin has been sent to operator Bosset in recognition of his initiative and ingenuity. His idea and hundreds of other practical ideas which come to Warner & Swasey are published in "Blue Chips", a shop bulletin sent free to the homes of over 70,000 turret lathe operators. Make sure your operators are on the mailing list—it will bring them helpful ideas and inspiration that can lead to increased production in your plant. Write Warner & Swasey, Cleveland, Ohio.

YOU CAN TURN IT BETTER, FASTER, FOR LESS...
WITH A WARNER & SWASEY

WARNER & SWASEY FOR VICTORY

What's In This Issue

C. L. FENN

Stretch-Press "Know-How"

C. L. Fenn, chief tool engineer, Edo Aircraft Corporation, climaxes his three-part series on the stretch-pressing art with specific recommendations in connection with this rapid and convenient method of forming aircraft sections, page 92.

Propellers Take a Ride

Mold handling is heavy work when done conventionally. Hamilton Standard Propellers neatly saves labor and press installations (for applying a rubber fairing on its propeller blade) by using a 40-ft. turntable on which curing and cooling are done. Details are given on page 89.

Twins Are Necessary

Identical toolbits are a boon when plunge-cutting multiple grooves in V-belt sheaves to standard shape and size. Dodge Manufacturing Company makes a business of sheaves, finds that its toolbit grinding fixtures, page 90, permit constant duplication of desired results at the machines.

Windmill Milling

Pressure to produce Liberty ship engines caused the Joshua Hendy Iron Works to devise what is aptly termed a "windmill" milling machine. This "wonderful and startling" creation serves very nicely to face the flanges of columns for ship engines, as disclosed on page 96.

Toolholders for Heavy Jobs

Tank manufacturers are using a toolholder evolved by Haynes Stellite engineers to employ standard toolbits, thereby simplifying grinding and inventory problems. An Armament Section article, page 113, tells how this toolholder, which is suitable for many heavy production jobs, is used to machine M-4 turrets.

Timesavers From Detroit

Chevrolet's production experience continues on the job, simplifying manufacture of aircraft engines, artillery and military trucks. The first selection of examples gives "before" and "after" data, including time and money savings. Turn to page 119.

J. E. WAUGH

Winning Combination

Laminations for large stators are commonly stacked one way; those for small stators in a different manner. It's the big stator with the small hole that poses the problem. J. E. Waugh of General Electric's Schenectady plant combined features of both methods, and now uses a procedure that puts 22,000 punchings together as easily as stacking books on a shelf. He tells about it on page 101.

Plant Previews

It's a lot easier to move models than shift a plant. That is why the Long Beach Plant of Douglas Aircraft uses code-colored plastic models of equipment and work in process to predetermine interferences and other production detriments existing in the two-dimension plan. To see how it is done, turn to page 87.

W. A. BURTON

Reduces Trimming Costs

From several years of experience, the Chicago plant of Crane Company concludes that hard-facing applied to the cutting edges of trimming dies extends tool life three to four times. How the facing is applied and successful die designs are matters taken up on page 98.

Milling Practices

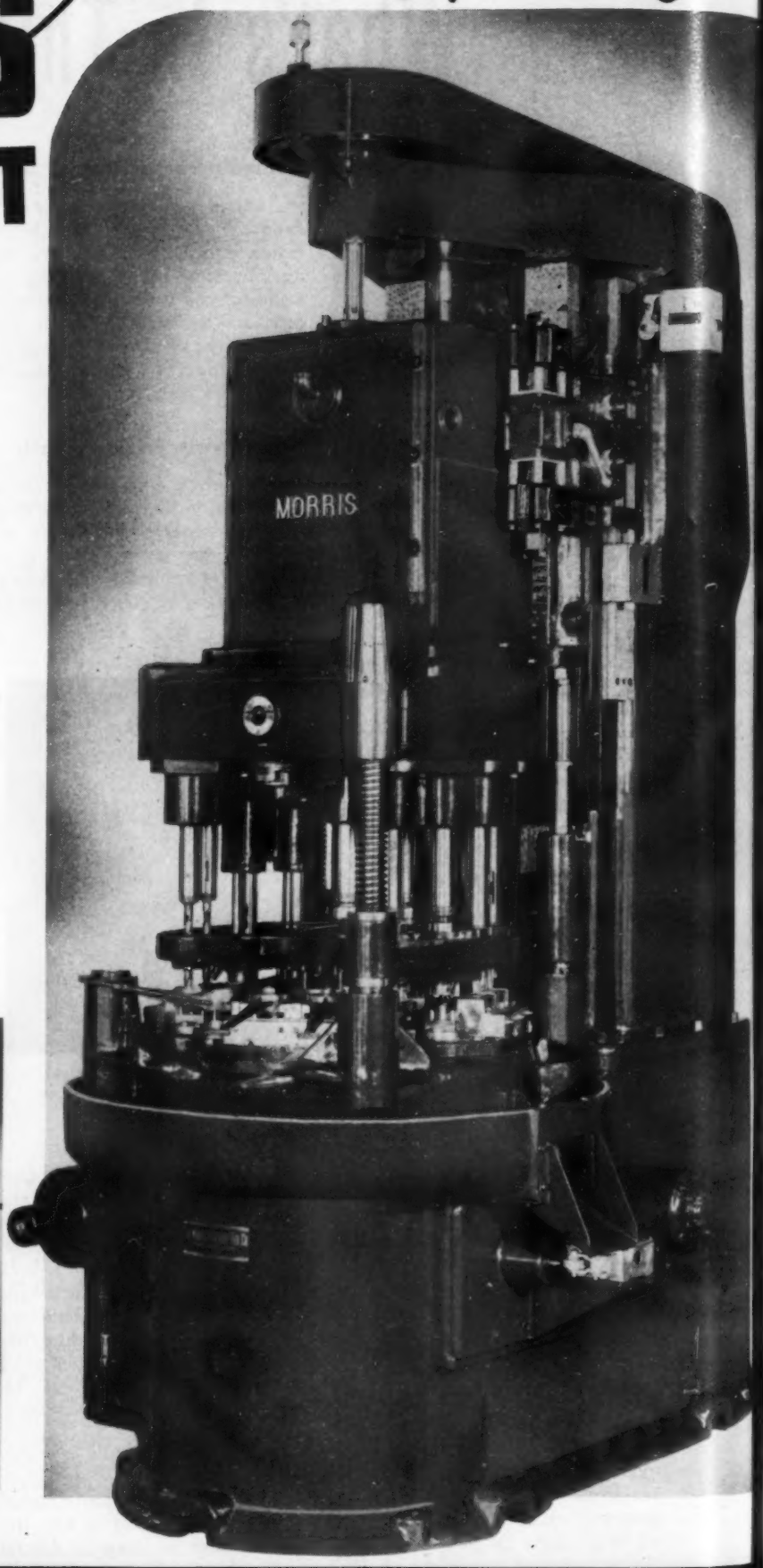
In the second of a series of articles devoted to toolroom milling practices, H. A. Frommelt, of Kearney & Trecker Corporation, illustrates and describes the cutting of quill racks, the slotting of keyways, boring and turning operations, and the cutting of dovetails in milling machines. Page 102.

COMING

Industrial use of plastics has been tremendously accelerated by shortages in critical materials. Wartime needs have brought forth new compounds, new techniques. The present score on plastics—materials available, properties, typical applications, machining and forming data—will be presented in a special section that you will want to add to your AMERICAN MACHINIST'S "Working Guide for Modern Shop Materials."

MORRIS EQUIPMENT

Automatic Specialized



● This machine was developed by Morris engineers to accurately drill, ream and counterbore steering wheel hubs on a mass production basis for a nationally known automobile manufacturer.

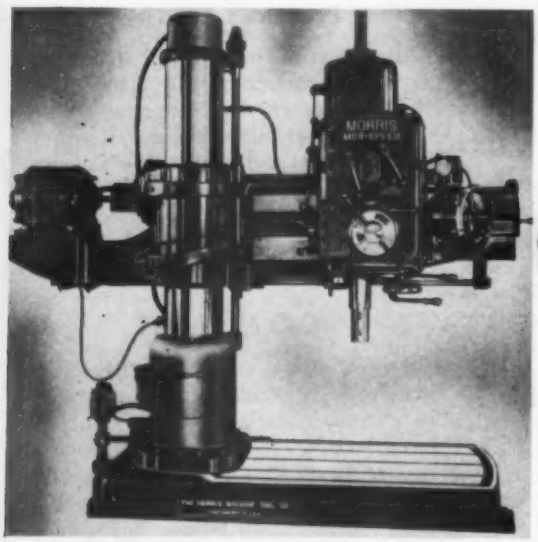
Illustrated is a 4 station, vertical, automatic indexing machine with standard, self contained, hydraulic feed unit operating 14 spindles. It also has a built in cutting lubricant system and automatic clamping fixture.

The self contained hydraulic feed unit is unique in that it can be used in any position and provides a wide variety of approaches and returns as well as feeds and speeds—and is fully automatic.

By merely substituting a different drill head and fixtures this machine is easily and quickly made adaptable to other jobs.

An organization skilled in the manufacture of special equipment—an engineering staff experienced in the design and development of special machines for mass production of specific jobs is available at Morris Machine Tool Co.

Consult them on your plans for high production of specialized work.

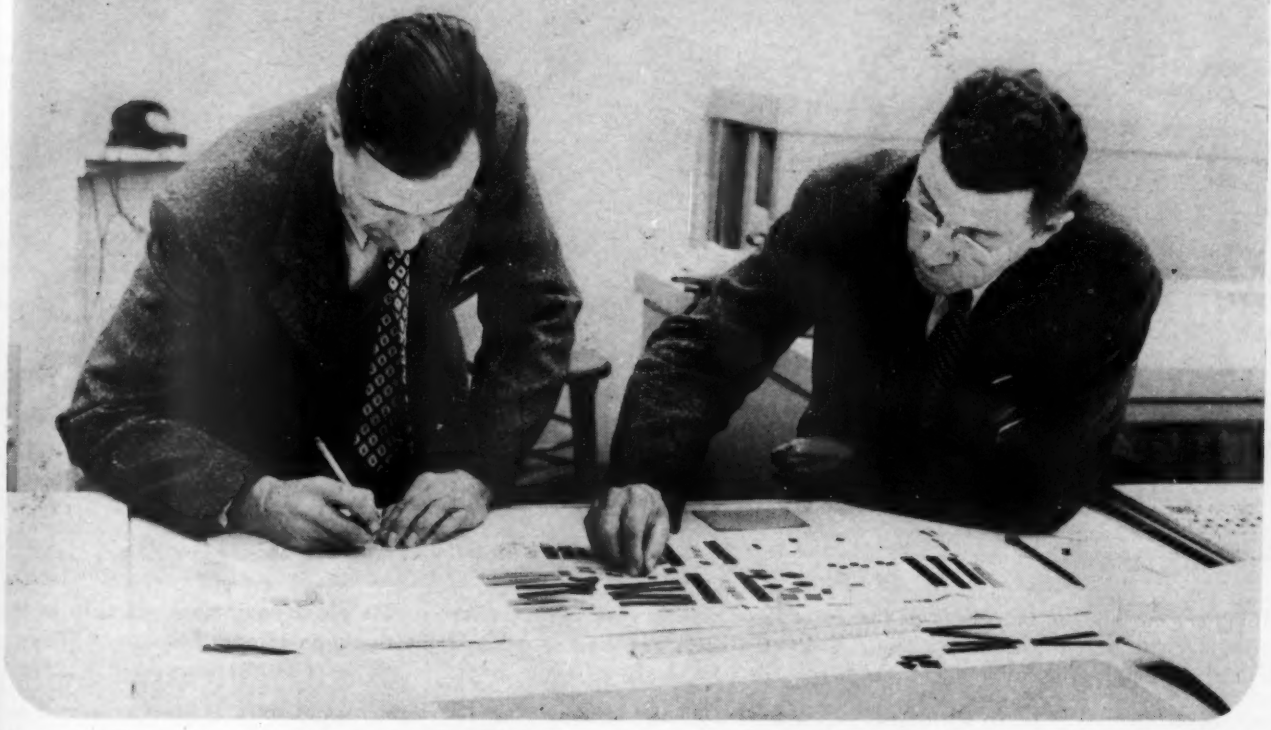


Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

American Machinist

ESTABLISHED 1877 · BURNHAM FINNEY, EDITOR



Scale templets are made of all parts, fixtures and manufacturing equipment in order to decide upon the preliminary, or ideal, plant arrangement without regard to building restrictions

Plant Layout in Three Dimensions

BY W. A. BURTON, SUPERVISOR OF PLANT EQUIPMENT, LONG BEACH DIVISION, DOUGLAS AIRCRAFT COMPANY

IN PLANNING THE ARRANGEMENT of equipment in a new plant or an existing plant some method of visualization is of great value. No amount of calculation will serve so well as a scale layout that will indicate equipment location, aisle space, storage areas and working areas.

Floor plan layouts, using flat templets to indicate equipment, have long been used for this purpose, but recently such layouts have brought in the third dimension to indicate overhead space. This practice is particularly helpful in the aircraft industry where large subassemblies and completed planes must be handled. It is being used at the Long Beach plant of the Douglas Aircraft Company.

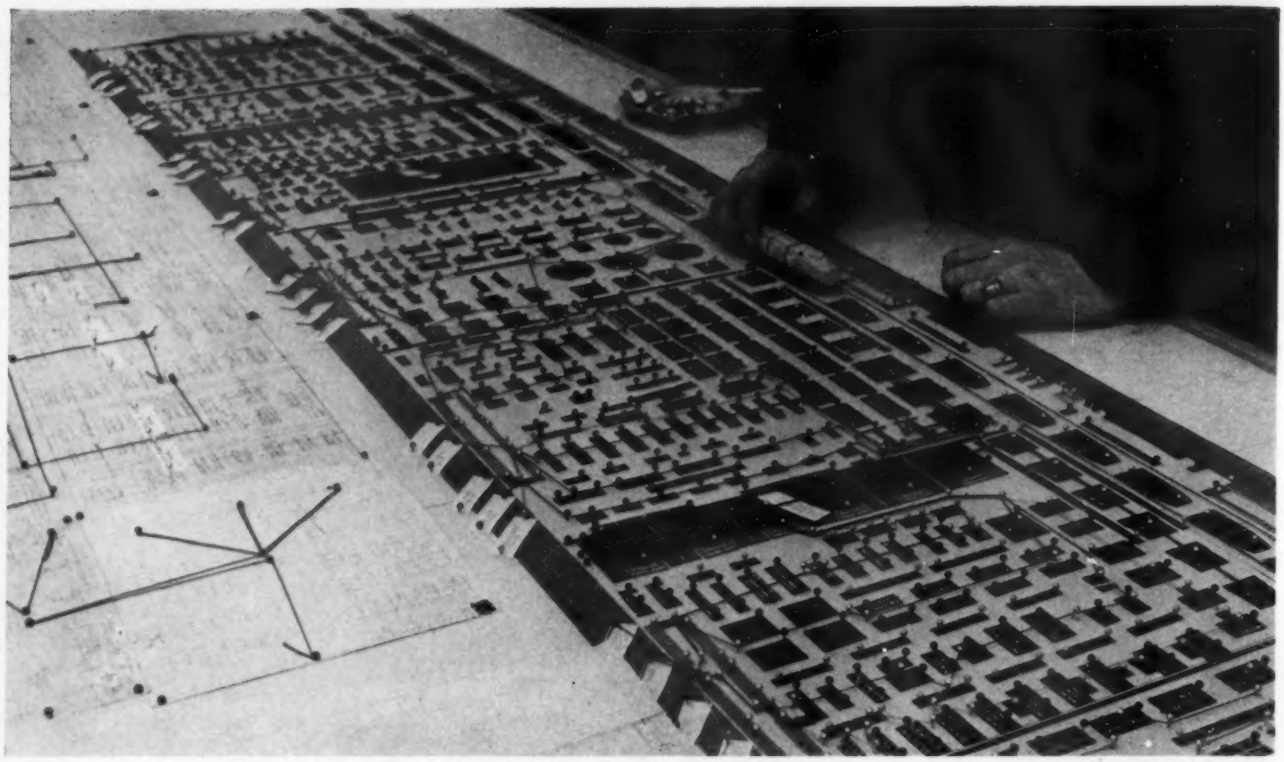
Boiled down to its elements the problem of plant layout consists of a given number of machines and men which must fit into a given area. Ample space must be allowed for materials, manufacturing equipment, material handling facilities, inspection departments, washrooms and all the other necessities of modern manufacture.

The first step is to gather the basic information on the product to be manufactured. These data are collected on an operation procedure sheet. Each part is broken down into individual operations, and time estimates are made on each of them. If the layout is for an existing plane these estimates are usually made in conjunction with the foreman or leadman and checked against time studies when they are available.

An important consideration is the production interval, that is the time each part remains in a given tool or fixture. Proper balance of these intervals means continuous work flow and a minimum of waste space.

With the basic material on hand, a rough layout is made using flat templets on a floor plan drawn to a scale of $\frac{1}{8}$ in. per ft. This is the ideal layout made without regard to building restrictions. All tools and fixtures are arranged so they will feed parts and assemblies into the main line exactly where they will be used. Straight-line work flow is used throughout.

The next step is to make the ideal layout conform to the building dimensions. This means forming U-shaped lines when a single line is too long and compromising on the location of



Templets are laid on blueprints of the plant floor plan in the same pattern as the plant equipment will take in the actual production lines. Colored strings are used to indicate the direction of work flow

each department in order to secure the best conditions compatible with physical limitations.

This second phase of the layout is still done with flat templets on a table built for the purpose. The third step is to convert the flat layout into a three-dimensional layout by the use of scale models of machines, benches, storage racks and the work itself.

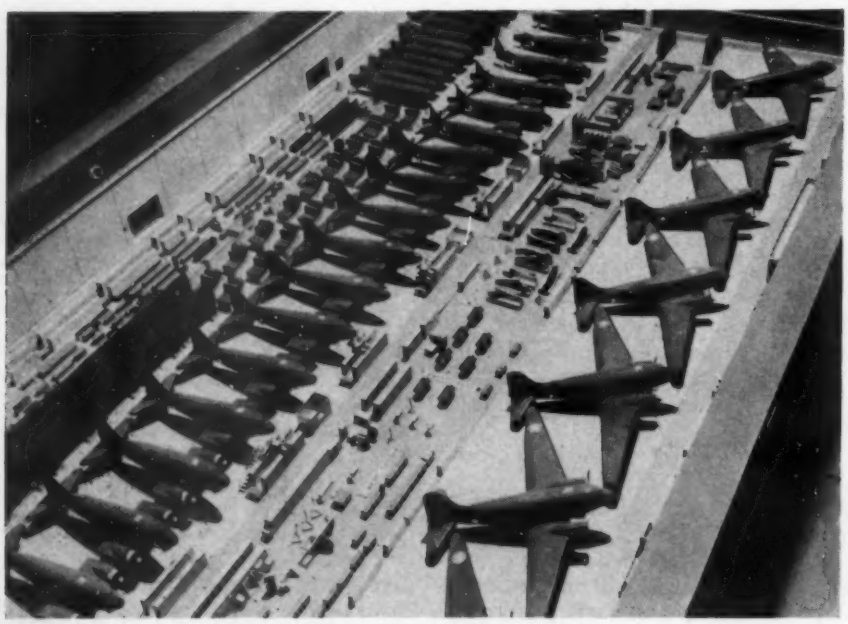
Once the models are made the layout clarifies itself. For instance in a final assembly line where the airplanes are moved at 45 deg. it is apparent that one ship can overlap the next because of differences in height whereas this would show as an interference on the flat layout.

The layout boards themselves consist of Cellotex painted white with the column lines accurately spaced upon them. Machine and plane models are made of cast plastic.

The part flow is traced by using colored string. The templets are also colored to distinguish their ultimate destination in the case of subassemblies, and their function in the case of machines, tools, benches, storage racks, and office and inspection areas. The project room contains a three-dimensional representation of the entire plant.

This method of layout was used to free 70,000 sq.ft. of floor area for the manufacture of a new ship in one of the buildings. This building was used for the final assembly of the *Flying Fortress;* it was found that the number of stations could be cut in half by moving certain operations back into the subassembly department in another building.

Three-dimensional layout enables the plant layout engineer to anticipate actual manufacturing conditions with greater confidence than any drawing or flat floor plan could possibly give him. It is far easier to shift a scale model fixture or storeroom than to make the change in full sized plant equipment.



Three dimensioned models indicate conditions difficult to foresee in a flat layout. Final result is compact arrangement of assemblies and fixtures

"Merry-Go-Round" Cures Propeller Blade Fairing

CERTAIN TYPES OF aircraft propeller blades are equipped with rubber fairings, or cuffs, near the hub end. These fairings are assembled by hand; they come in halves and are wrapped with sheets of uncured Ebonite. Then it is necessary to cure the rubber.

Formerly this was done by inclosing the blade in a curing mold under a hydraulic press. Since the molds are heavy and must be handled one at a time, the operation was a tedious one.

Hamilton Standard Propellers, Division of United Aircraft Corporation, has installed a "merry-go-round" 40 ft. in diameter for handling these molds under the press and during the curing cycle. The huge steel turntable is carried on rollers mounted on a concrete foundation. The flat outer rim of the table is divided into 42 slots, each of which carries a mold.

Each slot has its own supply of air, steam, water and electricity automatically controlled through cam-operated valves and Bristol pressure controllers. The main supply lines are brought from the center of the turntable to the molds by means of swing joints and slip rings. The cams are located in a covered trough at the outer periphery of the table and operate the valves through pushrods.

The machine table rotates once every eight hours, but since each blade travels only half a revolution, it is capable of curing two sets of 21 blades simultaneously. Each mold starts at a loading station, turns to a gap type hydraulic press, and moves successively through a steam-heating cycle and a water-cooling cycle, until it is unloading halfway around the circle. The heating cycle takes 2½ hours, and the cooling cycle 1½ hours.

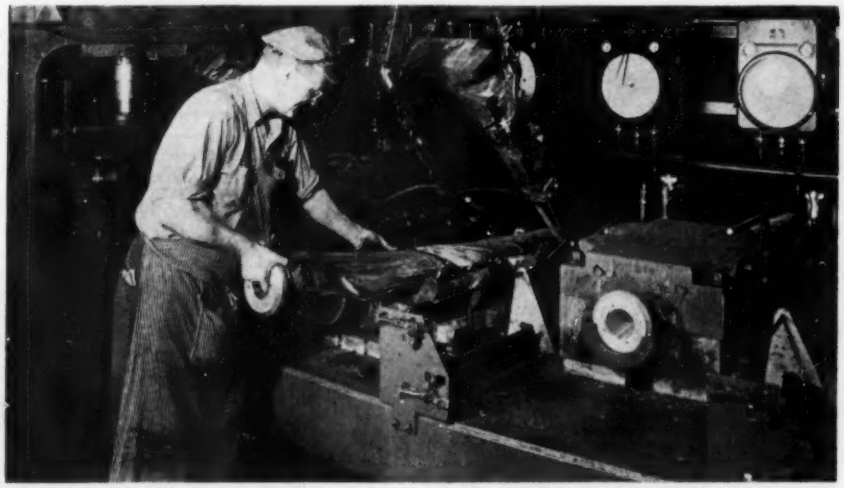
The machine turns intermittently clockwise advancing one slot every 12 min. It is moved by a pneumatic ratchet drive from a 14-in. air cylinder connected to the shaft's regular compressed air line.

The first step in the operation is to coat the inside of the mold at the loading station with wax; then the steam in the mold is turned on. A blade with the sponge rubber fairing attached is then inserted into the mold which is loosely bolted. A turn of the table carries the mold under one of the two 100-ton Farquhar hydraulic presses which closes under pressure. Excess rubber is forced out and the mold bolts are tightened.

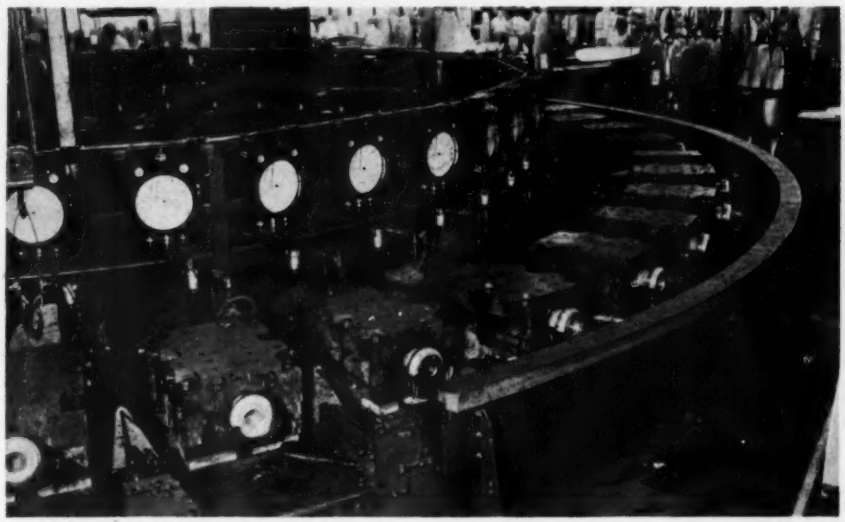
After the mold with its blade advances to the next position, a canvas and wool insulating blanket is put over it to conserve heat and protect the workers. The table then carries the mold by progressive steps to complete the heating cycle under steam pressure. At this point the heat is turned off and refrigerated water is circulated through the mold. The blade and mold are then cooled until they reach the unloading station 180 deg. from the loading point.

The mountings of the rotary table near the presses are on steel springs thus creating a slight "give" to bring the table into contact with the lower platen of the press while the mold is being closed. When the pressure is released the table lifts and clears the lower platen by about 1/16 in.

An overhead monorail which follows the mold positions above the table, carries six electric hoists used to open and close molds. Two of them are of 2,000 lb. capacity, and four of 1,000 lb. They are supplemented by two, 500 lb. crane hoists.



The blade is inserted in the mold at the lower station before advancing to the hydraulic press where the mold is bolted shut under pressure



Each mold slot has its own temperature indicator and controls. The cam track which operates the valve is protected by the circular trough which runs around the periphery of the table

Grinding Fixtures for Grooving Tools

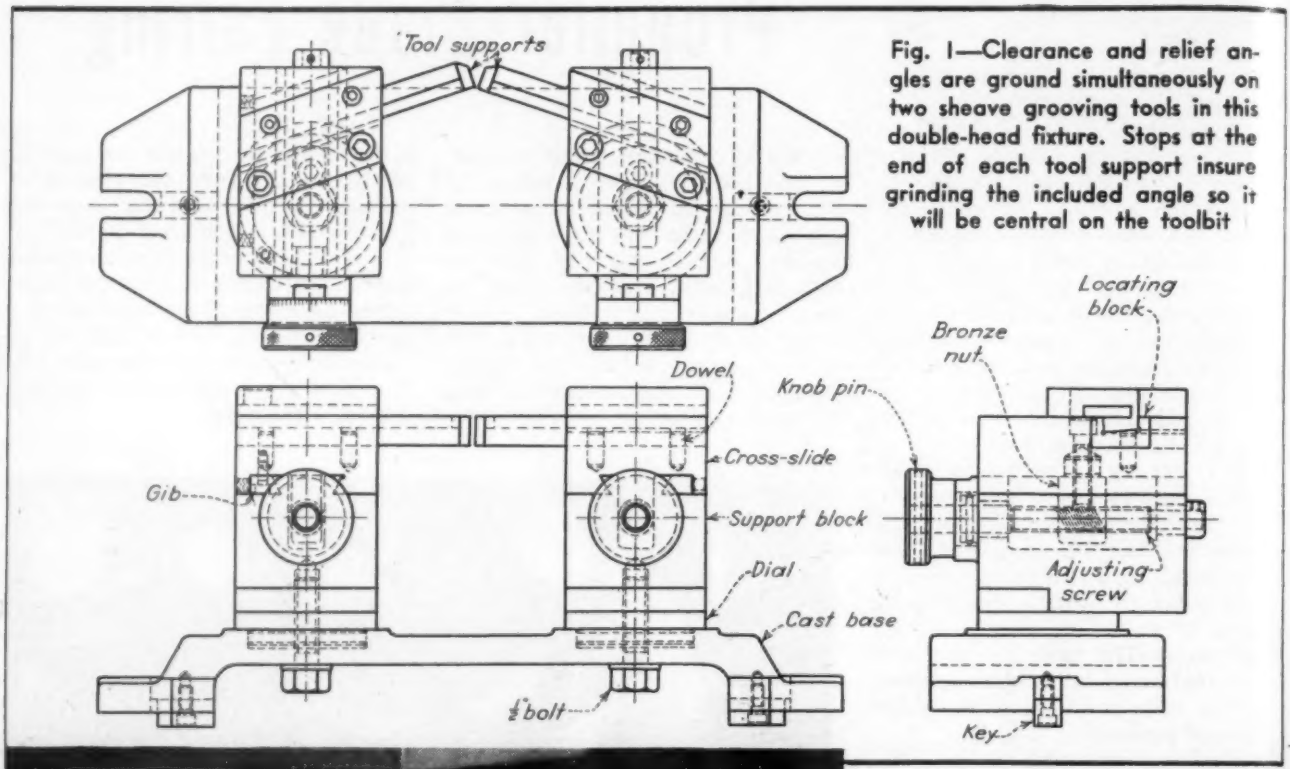


Fig. 1—Clearance and relief angles are ground simultaneously on two sheave grooving tools in this double-head fixture. Stops at the end of each tool support insure grinding the included angle so it will be central on the toolbit

The machining of accurate grooves in V-belt sheaves with multiple tooling requires identical toolbits. Grinding fixtures described here maintain the necessary tolerances on these tools

SHEAVES for multiple V-belt drives are made in a large variety of diameters, number of grooves and materials by the Dodge Manufacturing Corporation. After the sheaves have been finish turned, faced and bored, they are grooved in Foster turret lathes especially tooled for this operation. Sheaves too large in diameter to be grooved in turret lathes are finished in the boring mills on which they are turned and bored.

Multiple-tool set-ups are used on the turret lathes for rough and finish turning the grooves. The toolblocks on the front and rear cross-slides are arranged to hold side by side the toolbits required for roughing or finishing all of the grooves in a given sheave in one operation. Roughing bits are mounted in the block on the rear slide, while the finishing bits are carried in the block on the front slide. Roughing and finishing is done with a plunge cut, the tools being advanced directly into the work. To insure accuracy of the grooves, and to simplify the tool setting problems as much as possible, it is essential that all of the toolbits in a roughing or a finishing set be ground as nearly identical as possible. These bits are made of high-speed steel, Stellite, or of mild

steel tipped with a cemented carbide, depending upon the material from which the sheave is made.

With a large number of grooving toolbits to be ground to very close tolerances, the load on the tool grinding department was very heavy until special fixtures were designed to hold the grooving toolbits during the grinding operations. These fixtures are shown in the accompanying illustrations.

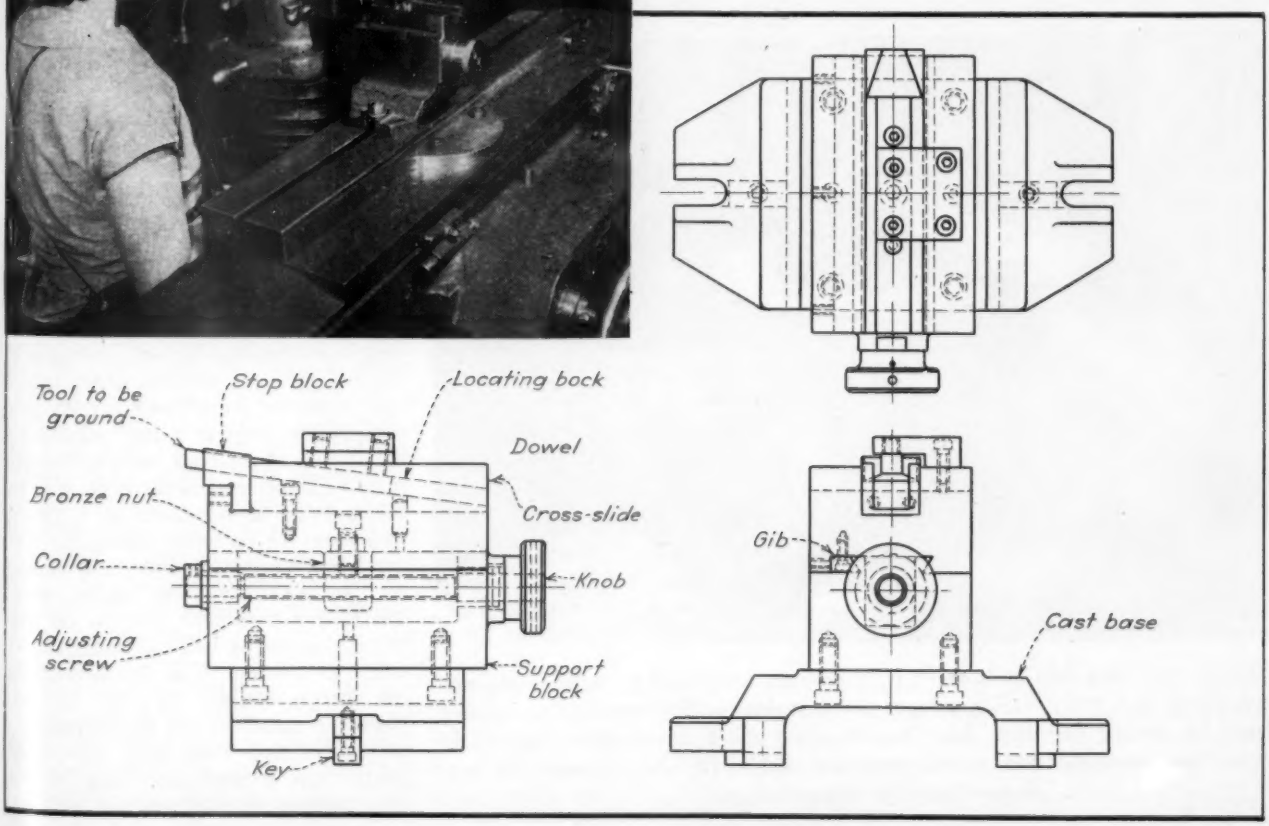
In Fig. 1 is shown the two-position fixture employed for grinding the opposite side cutting edge angles on the grooving bits. Two bits are ground at a time, then are interchanged in the holders for grinding the opposite sides. The two support heads on this fixture have slides with which the toolbits can be positioned in relation to each other, in order that the two tools may be ground at the same time. Also, each head can be rotated about its vertical axis, and so permit changing the included angle between the two side cutting edges of the tool. When the dials under each head are set at zero, an included angle of 36 deg. is ground on the toolbits. The fixture has a micrometer adjustment for setting the heads and for clamping them in position in order to insure accurate side cutting-edge angles.

Interchangeable, locating blocks are mounted in the slides on this fixture so as to permit grinding toolbits of different sizes without having to make adjustments for relief and clearance angles. These blocks are ground so that the proper relief or clearance angle is ground automatically while grinding the side cutting edges. Separate sets of blocks are used for grinding the 5 deg. clearance angles and the 3 deg. relief angles on the side cutting edges. Usually, the clearance angles are ground first, and then the relief angles are ground up to the cutting edges. The locating blocks extend out from the support heads to provide adequate support under the toolbits while they are being ground.

A separate fixture has been developed for grinding the 7 deg. end relief angle on grooving toolbits. This fixture is shown in Fig. 2. Like the fixture shown in Fig. 1, this fixture has a slide to permit adjusting the tool toward or away from the wheel. This permits setting the table on the grinder in position, and then making fine adjustments with the knob on the fixture. As with the fixture used for grinding the side cutting-edge angles, this fixture has interchangeable locating blocks and stop blocks for the different sizes of toolbits. Since the same end relief angle is ground on all tools, the slide holds all of the locating blocks at the same angle. Stop blocks locate the tool against the previously ground side cutting-edge angles, thus making it possible to always grind the end cutting edge to the same width. This would be difficult if the tool were located from the other end, as is done in many grinding fixtures.

In both of these grinding fixtures, the bases, supports and slides are made of high-tensile alloy cast iron and the other parts are made of cold-rolled steel or low-carbon machine steel. Sliding and locating members are hardened and ground to insure accuracy. It will be noted that the drawings show headless setscrews for locking the toolbits in position. However, this involved the use of setscrew wrenches. The fixtures have been revised as shown in the photographs, to provide locking screws with large heads that can be turned easily with the fingers. Time previously required for locating and selecting a setscrew wrench thus is eliminated.

Fig. 2—This fixture holds the toolbits for grinding a 7-deg. end relief angle. Interchangable locating blocks and stop blocks, used for different size toolbits, insure that all bits will be ground to the same width and length



The Technique of Stretching Aluminum

BY C. L. FENN, CHIEF TOOL ENGINEER, EDO AIRCRAFT CORPORATION

Unless used within 20 min. after heat-treatment, aluminum sheet can be stored at or below freezing temperature to arrest age-hardening. Maximum storage time should be around 24 hours

EITHER 17-S or 24-S aluminum alloy may be stretched in the SO, SW or ST condition. For this discussion, consideration is limited to structural members, stress carrying fairings, or fairings which are subject to such heavy air loads that they require their ultimate condition to be ST. Operations performed on sheets in the SO condition easily result in beautifully formed sheets which, when heat-treated in a salt bath and then quenched in a water tank, usually warp to such an extent that they are unsatisfactory for use without a subsequent forming operation. In cases where an air heat-treatment and a quench chamber are used, satisfactory results may be obtained by very carefully locating and spacing the sheets in the carriers. This method of heat-treatment produces sheets which are less corrosion-resistant than those quenched in a water tank and, consequently, are not as suitable for use in and around salt water.

The intermediate unstable condition, described for brevity as SW—a term that has come into wide use in the aircraft industry—is best for sheets that are to be stretch formed. This is the condition of an aluminum alloy sheet after heat-treatment and quenching, but before 20 min. have elapsed with the sheet at normal room temperature. When a heat-treated and quenched sheet is left at room temperature for more than 20 min., it age-hardens at a rapid rate. After about 24 to 30 hours, the material has almost completely aged to the ST condition. The age-hardening process may be arrested by reducing the temperature of the sheet below 32F.

Methods used at the Edo Aircraft Corporation for arresting the age-hardening of heat-treated and quenched aluminum alloy sheets have proved efficient in production. The procedure is as follows:

The sheets to be stretched are first rolled into coils approximately 10 in. in diameter. The individual coils then are placed in wire baskets and immersed in a molten salt bath for the required number of minutes. The basket with the sheet still in place then is removed from the salt bath with an electric hoist and immersed in a water tank for quenching in the minimum time possible. Immediately after quenching, the sheets are placed in a series of refrigerators which have racks for supporting the coils. Here, the heat-treated sheet stock is held at —10 to 0 F. until required by the shop, or until 24 hr. have elapsed. Although sheets have been satisfactorily stretched after a lapse of 39½ hours, it is not advisable to hold them as long as this is in regular practice.

When removed from the refrigerators, the sheets are covered with a coat of ice on each side. They are uncoiled and the ice inside of the sheet which will come in contact with the forming block on the stretch press is removed. The ice on the outside of the sheet is of no consequence since it melts rapidly, due largely to the heat generated during the stretching operation, and the water runs off or evaporates. The use of refrigerators makes it possible for the sheets to be heat-treated, quenched and stored during the night shift when the load on the heat-treating tanks is low, and the heat-treatment of the sheets does not interfere with production during the normal day and first night shifts.

Sheets stretched in the SW condition have practically no springback. In fact, when a finished sheet is replaced on the form block, in 95 percent of the cases it is not possible to detect any spring-back, and in the remaining 5 percent of the cases it is in the order of a maximum of 1/32 in. in a sheet 14 ft. long. Since the SW condition is intermediate and unstable, and the material age-hardens without further treatment, there is no distortion caused by heat-treatment subsequent to forming. The stretched sheets are merely stacked on edge and allowed to stand for 24 to 30 hours—at which time they have developed nearly full strength and may be cut and trimmed to exact size for use.

Sheets are rolled into coils of 10 in. diameter, immersed in molten salt, and quenched in water. This produces an unstable or SW condition, which is best for stretch forming. Such heat-treated sheet age-hardens rapidly at room temperature, and unless stretched within 20 min., it must be kept below freezing temperature

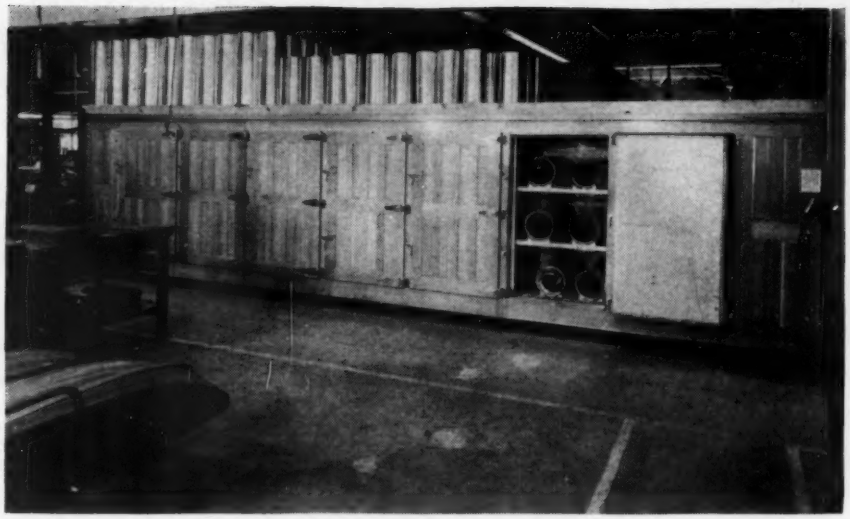
There is another advantage to stretching in the SW condition, which also is due to the absence of spring-back. The form blocks may be made precisely to the molded lines of the structure, with no allowance for spring-back. This is particularly helpful when it is necessary to get a part into production quickly and there is not sufficient time to recut the block in order to provide allowance for spring-back. Templets laid out in the mold loft to the exact shape of the part desired can be used to make the dies, with complete assurance that the parts produced will be satisfactory.

It may be contended that since the sheets remain soft for only 20 min., it will not be possible to stretch difficult forms completely before the time limit has elapsed. However, the time required for finishing sheets 14 ft. long on a production basis is under 7 min., floor to floor. For smaller sheets, approximately 6 ft. long, the floor-to-floor time is only 1.79 min. in runs of 200 pieces or more. We have yet to encounter a sheet that cannot be stretched on a production basis in 12 min. or less, and this allows a leeway of 8 min. before the sheet starts to age-harden.

On long production runs, and in cases where time permits the development of a form block with proper spring-back allowance, stretching in the ST condition will reduce the cost of stretching. There are two reasons for this. First, it eliminates the coiling, heat-treatment, quenching, refrigeration and uncoiling of the sheet. The second reason is that sheets in the flat "as received" condition are inherently easier to handle and insert in the stretcher jaws which results in a noticeable saving of time. It is not possible, however, to form as deep draws in the ST as in the SW condition.

Lubrication is Important

One of the first considerations of production operation is the proper and rapid lubrication of the form block or the sheet to be stretched. Since not all plants are equipped with greasing or oiling rolls, it is assumed that the lubricant is to be applied to the form block. This is most expeditiously done with a brush, which should at all times be kept absolutely free from grit or metal chips. The lubricant iself must be carefully covered when not actually in use. It is highly important that the machine operators be impressed with the fact that the surface of the block be clean. A single chip imbedded in the face of a wooden block has caused severe damage to a large number of stretched sheets with consequent "inspection" difficulties.



The age-hardening of heat-treated sheet is arrested by storing it in refrigerators at a temperature between—10 and 0 F. Maximum storage time before stretchiing should be 24 hours for best results

The lubricant itself may be a good grade of automobile chassis semi-fluid oil or plain S.A.E. No. 50 motor oil. Extreme pressure oil used in hypoid gear rear axles does an excellent job, but it is difficult to remove without adequate de-greasing apparatus since it adheres strongly to the sheets. Its use is not recommended.

It is not necessary to oil the form block after each sheet is stretched. If wooden dies are used, and not sufficiently lubricated, the sheet will squeak as it is stretched. This is a positive indication that the block is dry. With Kirksite, or cast-iron dies, the squeak is not so pronounced and, consequently, more care must be taken in determining the number of sheets which can be stretched without re-oiling the surface of the form blocks or dies.

The actual processes of stretching normal nose cowl segments, or other parts of the same length-to-width ratio of the stretched sheet, require no particular care during the stretching operation. Hence, we will not discuss them further. However, sheets which have a great length-to-width ratio with relatively small crown in their length and a severe crown crosswise present a very genuine problem. Fig. 1 shows a typical form block of this type. These sheets must be stretched over the die in the longitudinal direction due to the width limitations of the rolling mills. When the sheet is loaded in the direction shown by the arrow in Fig. 1, almost invariably a bubble or "hat" section forms at the high point of the crown as shown in Fig. 2, which is a section through a form block and sheet at the middle of the block. It is characteristic of these "hats" that as more load is applied to the sheet, the width of the crown decreases and the height increases, as shown in Figs. 3 and 4. Normally the "hat" section will start approximately 5 in. from each end of the block, build up uniformly to its maximum depth in about 18 in., continue it at a maximum constant depth toward the opposite end of the block, and fade out in the same way it built up, as shown in Fig. 2. This peculiar characteristic of the sheet is most undesirable except in very rare cases where such a stiffener is actually designed in the part.

There are several ways of overcoming the formation of "hat" sections, one of which, as follows, seems to be the simplest and most effective. The first step is to set up the form block in precisely the position in which the sheets are to be stretched over it. A good general rule to follow is to have an 11 deg. angle between the direction of the pull of the jaws and the tangent to a normal to the surface of the block at the point where the stretched sheet will make its first contact with the block. After the block is set up, the next step is to determine the size of the blank. In the case of draws 5 in. or more deep, it is advisable to allow between 24 and 30 in. of free sheet at each end of the block to allow for the equalization of stress in this area; otherwise, one section of the sheet at the clamping jaw will be loaded beyond its ultimate strength and break. (Experience has shown that if only a small part of the sheet fails, it will tear across its entire width.) Also, the sheet should be about 1 in. wider on each edge than the finished part to allow for small errors in location of the blanks in the press. Cut a piece of heavy brown wrapping paper to the size of

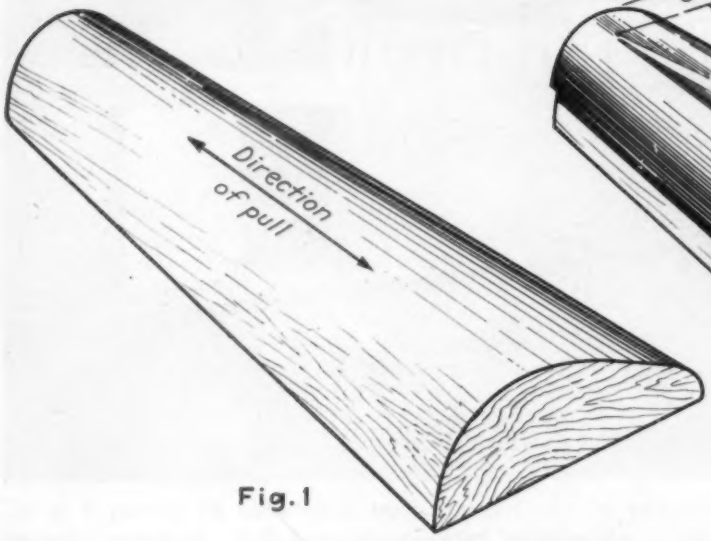


Fig. 1

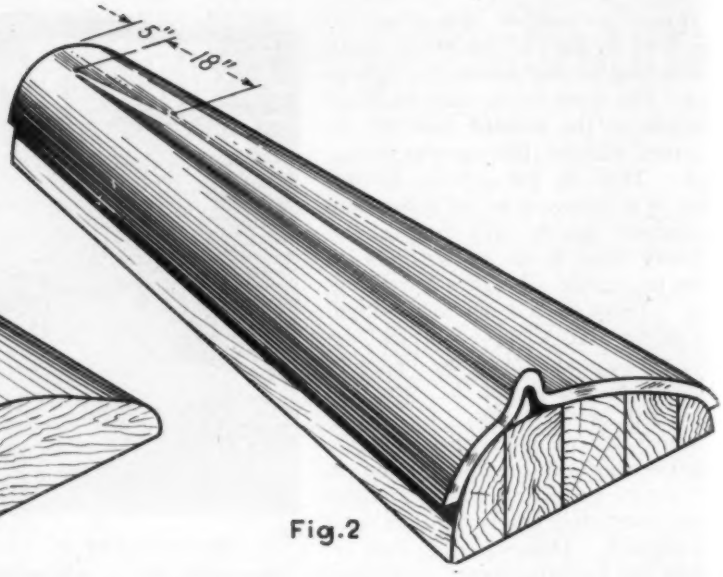


Fig. 2

the blank to be stretched, place it over the form block and insert it in the jaws of the machine. Under load, the paper will behave exactly the same as an aluminum alloy sheet provided its ultimate strength is not exceeded. In other words, under a light load the paper will produce a hat section at precisely the same point an aluminum alloy sheet does; therefore, the use of paper trial sheets saves valuable metal and is recommended.

When a hat section is developed in a trial paper sheet, stop the machine. Mark the paper at each end of the hat section and also at the extreme ends of the block before removing the trial sheet from the press. Draw a center line through the two points determined by the ends of the hat section on the paper sheet, and cut a slit at both ends along this center line to within about 2 in. of the extreme ends of the block at either end. Replace the paper in the stretch press in exactly the same position it was in the original set-up. Clamp one end of it in the jaws of the machine and then pull the two tabs at the opposite end together, lapping one over the other, until the edges of the sheet lie tight against the form block at that end. The tabs should be swung toward the center line equally. Mark the jaw of the machine with pencil at the outer edge of each tab while they are pulled together. Release the tabs and allow them to snap back to the straight condition. Mark the jaw once again at the outer edge of each tab. By measuring the distance between the two pencil marks on each side, the semi-width of the V is immediately determined. Repeat the same process at the opposite end. Now lay out the notch (or "fish-tail" as it is called in the shop) using the width determined from these marks on the jaws and extend it in the form of a triangle to the end of the slit. As shown in Fig. 5, the two lines should come tangent to a semi-circular cut-out of not less than 5/16 in. radius at this point.

These notches can be very satisfactorily made in producion, using a swing-arm router and a suitable guide templet. It is highly essential, however, that the router-cut sheets be absolutely free from nicks or chatter marks along the edges of the "fish-tail" cut-outs. The desired degree of smoothness can be obtained either by a Brightboy wheel or rubbing by hand with fine emery cloth. Furthermore, it is essential that there be no stress raisers whatever in any of the edges of the sheet. Experience has shown that a small nick 1/32 in. deep in the edge of the sheet will cause it to tear at that point.

When stretching the first developed blank, be sure it is located on the form block in exactly the same position as the trial paper sheet. Pull the tabs at each end together until the width of the notch is decreased about 50 percent. The first application of load usually produces a large bubble at the high point of the crown of the block. This is quite normal. Continue stretching and gradually the bubble will disappear and the sheet will be tight against the die. When this condition is attained, stop the press immediately, for further stretching will produce a hat section impossible to remove.

The procedure outlined above is a method of attack, and some deviations from it are at times necessary, or convenient. For instance, it may be found that the tabs need to be pulled together more or less than 50 percent of the width of the notch to produce the part. Further, the 2 in. dimension locating the end of the notch from the end of the block is a reasonable minimum which should be increased

The formation of hat-section bubbles or ridges during stretching can be avoided by notching the sheet. If bubbles appear in notched sheets, stretching should be continued since they will disappear as the sheet is pulled down tight on the die

FIG. 3-Start of Hat Section

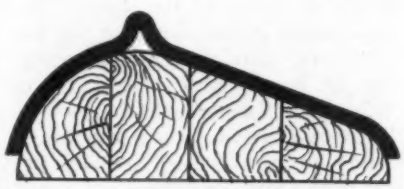


FIG. 4-Fully Developed Hat Section

to 4 or 5 in. in cases of deep draws of 9 in. or more to produce the part, or vice versa. Blanks should have the smallest notch permitting satisfactory forming of the part, since this lessens the danger of sheet breakage in the tabs. The maximum width of the notch at the jaws is determined by the ratio of the yield point to the ultimate allowable tensile stress of the material. For 24 SW aluminum alloy, the width theoretically should not exceed 57 percent of the width of the sheet. In practice, it is better to stay under 40 percent of the width.

Probably the most important single factor in the successful production operation of a stretch press is the clear establishment of a definite stretching procedure for each different form block. Experience has shown that if

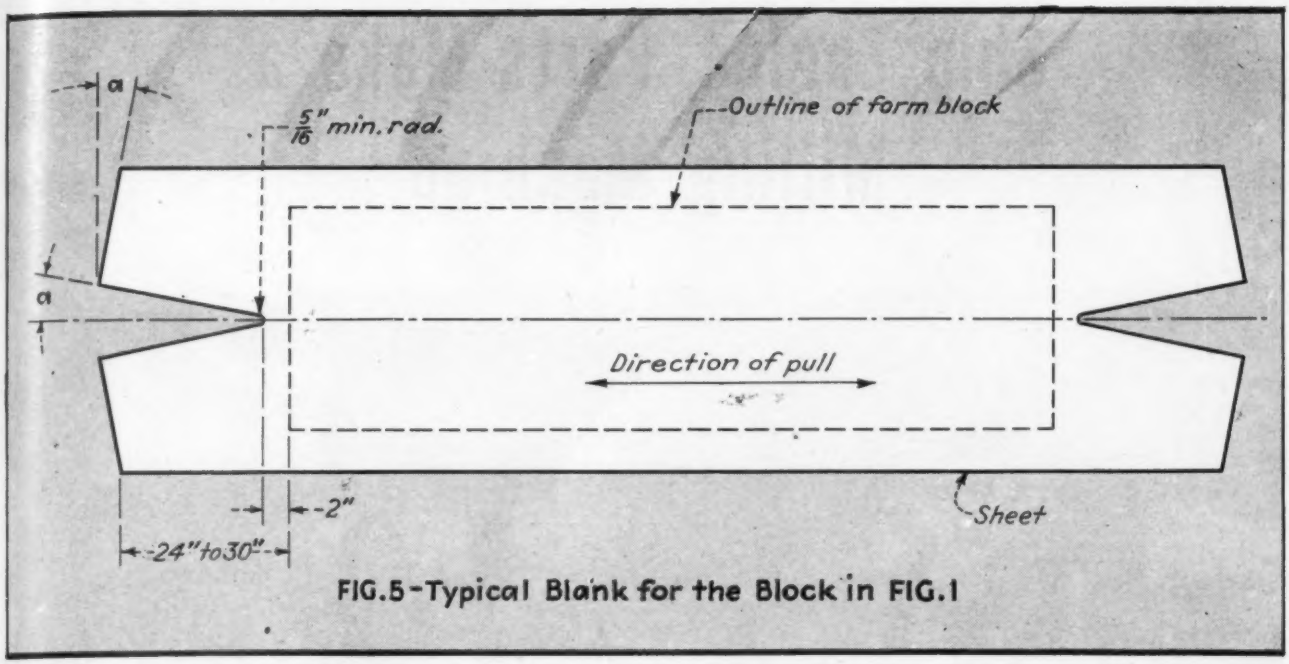


FIG. 5 - Typical Blank for the Block in FIG. 1

no definite procedure has been set up by competent personnel, the operation of the stretch press becomes somewhat of a mystery and the results are neither constant nor reliable. The procedure should be established by a tool engineer and not by the shop. The following should be determined:

1. The precise setting of the machine to give the correct angle of pull of the sheets over the ends of the block.
2. The optimum speed of the rising bed, or retreat of the tension rams.
3. The maximum hydraulic pressure to be carried in these rams so that the sheets will be completely stretched but will not break.

A chart should be prepared carrying the part number, the die number and a diagram of the machine so arranged that the pertinent dimensions may be recorded in blank spaces. Spaces should also be provided for recording the pressures and speeds of the rams. With this accomplished, the form block and the master diagram should be released for production, with iron-clad orders that the procedure set forth in the master diagram must be followed.

The stretching process is not limited to the working of aluminum alloy sheets. Sheets of annealed S.A.E. 4130 and 4345 steel, 0.035 in. thick, have been successfully stretched over a standard wood die for a float forward bottom sheet. Stainless steel, both in the annealed and in the quarter-hard condition, also stretches very well. In fact, annealed stainless steel is the easiest material thus far encountered with which to obtain a deep draw.

Thus far, the use of the stretch press has been confined almost exclusively to the aircraft industry. Post-war commercial expansion, however, probably will carry it into other fields. Other products which can be profitably formed by stretching are automobile turret tops, steel lifeboat skins, segments of spherical tanks, ornamental moldings of aluminum or bronze, curved sections of bus or truck bodies and the fairings on streamlined trains.

Because of the low initial cost of form blocks and the speed with which they can be made, large-volume manufacturers producing new models every year will be able to cut over-all tooling costs by stretching sheets for experimental and show-room models, and for moderate production output. They can thus avoid scrapping expensive dies if forced to change design even after moderate production is under way.

The increase in size probable in post-war aircraft undoubtedly will lead to the development of machines capable of stretching much larger sheets of heavier gages than is possible at present. While the largest finished sheet now stretched on a production basis is 18-ft. long and 4-ft. wide, inquiries already have been made for machines to stretch finished sheets more than 22-ft. long.

Color Overcomes Women's Fear of Machine Parts

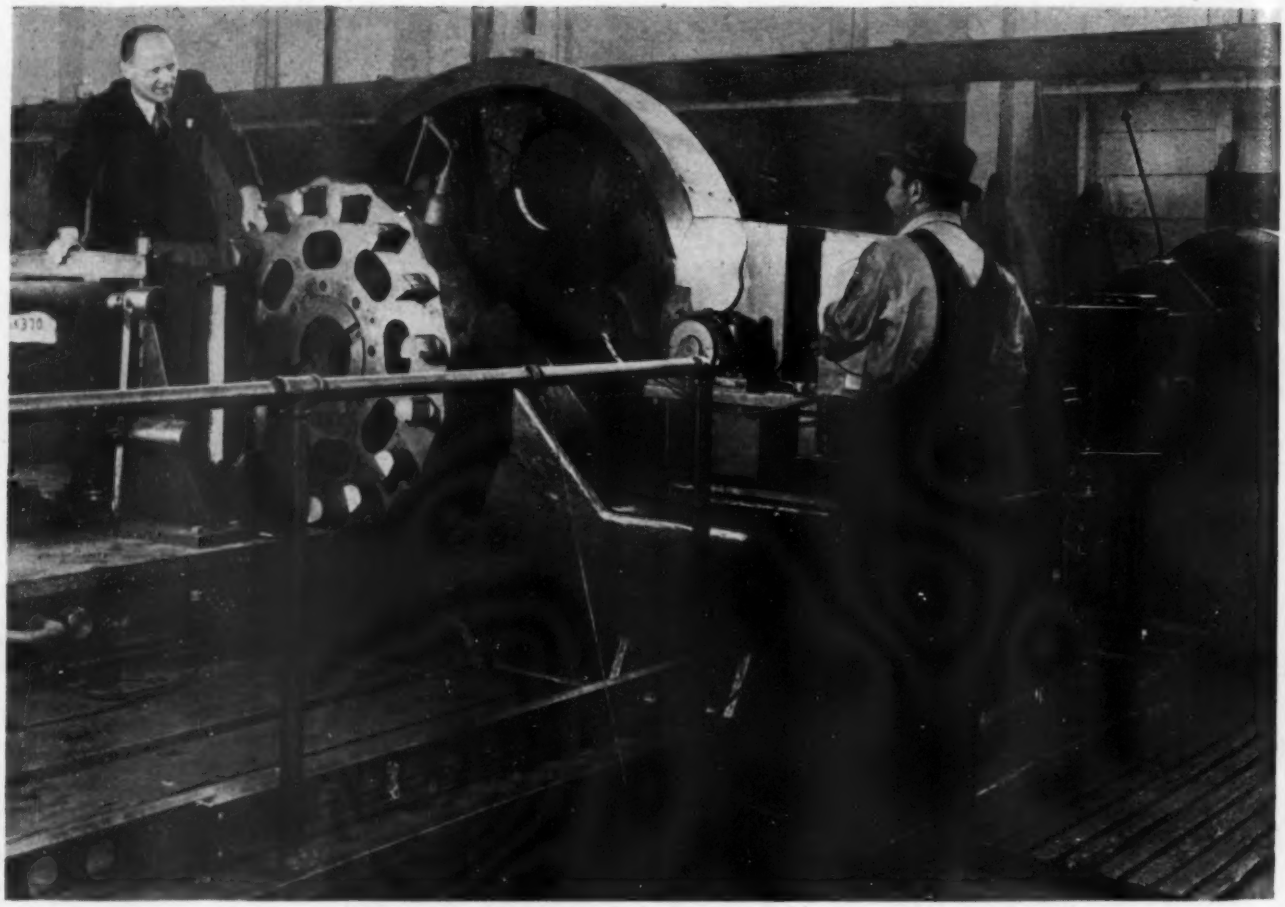
BY ROBERT MAWSON

WOMEN CAN BE TRAINED to do bench and assembly work, but many of them have a fear of machine tools that is difficult to overcome. It may seem strange, but many girls can be trained to operate any machine tool except a milling machine. This type seems the most difficult for them to handle without constant fear. The reason may lie in the fact that the milling cutter has many cutting surfaces and that the fine metal chips are being formed constantly while the machine is in operation.

To meet this situation the machine tools must be equipped so that fear is removed and women can operate them satisfactorily. One machine shop has done this by painting the main castings with a battleship grey and the moving parts with red. For example, a shaper ram and the gears of a lathe were painted in the color that signifies danger. This signal tells the operator that this portion of the machine is the only part that can injure her, and she loses her fear of the machine as a whole.

As a result of this simple precaution the girls in a shop employing female labor almost exclusively have lost their fear of operating machine tools and accidents have been reduced. Moreover the efficiency of the plant has been materially increased since the use of color to denote danger points.

Ship Engine Parts Make a Milling Machine



Scrap parts and engine castings form the basis of a special machine tool that doubles previous output

TO MAINTAIN the accelerated production of Liberty ship engines, which stand 2½ stories high and weigh 274,000 lb., the tool department of the Joshua Hendy Iron Works has devised some "wonderful and startling" devices. To solve one of their problems a special milling machine, now affectionately dubbed the "windmill," was originated.

The problem was to devise a milling machine that could face the upper and lower flanges on the columns which support the low, medium and high pressure cylinders of the Liberty engines. The lower flange measures 36½×31½ in., the upper one only slightly less, and the distance between them is 13 ft. 1 in. A tolerance of 0.001 in. is allowed between the two flanges.

Up to the time the "windmill" was constructed, the milling operations had been done on openside planers which did the job satisfactorily, but not with the speed and accuracy required at the Hendy plant.

Few Parts Purchased

The only materials that came from outside the plant for the new milling machine were the anti-friction bearings and the Meehanite castings for the cutter head. Production rate from it is twelve columns per day instead of the former six per day from the two planers.

Power to drive the cutter head comes from a 15-hp. d.c. motor resurrected from the scrap pile, driving through two stages of reduction gears that give a 200:1 reduction ratio. The head is fitted with 16 Stellite tipped cutters on a 37½-in. circle, turning from 1½ to 6 r.p.m. The table rides on 20-ft. ways, with a maximum feed speed of 4½-in. per min., and a minimum of 9/32 in. per min. Reverse travel, from a second source of power is 125 ft. per min.

The d.c. motor provides speed variation through a rheostat from 300 to 1,200 r.p.m. Between the motor and the first pinion is a Brown-Lipe truck transmission which gives a 2:1 reduction ratio. To the slow speed shaft of this transmission is keyed the first pinion of the main reduction gear.

A heavy concrete foundation takes the place of a bed-plate, supports the entire machine and greatly reduces the cast iron required. The bull-gear is mounted in a Liberty ship engine bed,

and the shaft is a portion of a Liberty crankshaft. The bearings for the bull-gear shaft, also, are Liberty engine parts. All of the gears were cut in the Hendy shops.

Maintenance of close alignment between the carriage and the cutter head required the use of two different types of ways. One is V-shaped with tapered rollers to take the horizontal thrust. The other is a channel with rollers that fit the channel section to absorb vertical thrust. Both rails are mounted on leveling blocks along their 20-ft. length, with wedges and screws that adjust them vertically. To maintain rails parallel with each other and at right angles to the cutter shaft, horizontal adjusting screws are provided. So rigid is the machine that since the original installation, no further adjustments have been necessary.

The feed mechanism for the table is controlled separately from the cutter-head drive, but automatic switches are provided that stop the cutter head motor if the feed motor stops, and vice versa. Power for the table feed comes from a 1½-hp. U. S. Varidrive motor supported from the under side of the table. The Varidrive worm-gear drives a nut which, as it rotates, causes the table to travel along a screw that runs the full length of the ways. Thus the slow feed of the table is made possible. The Varidrive speed control varies the table travel speed from 3/16 to ¾ in. per revolution of the cutter head, which corresponds to 9/32 to 4½ in. of travel per minute. This variation is necessary because of the difference in hardness of the columns and to prolong tool life.

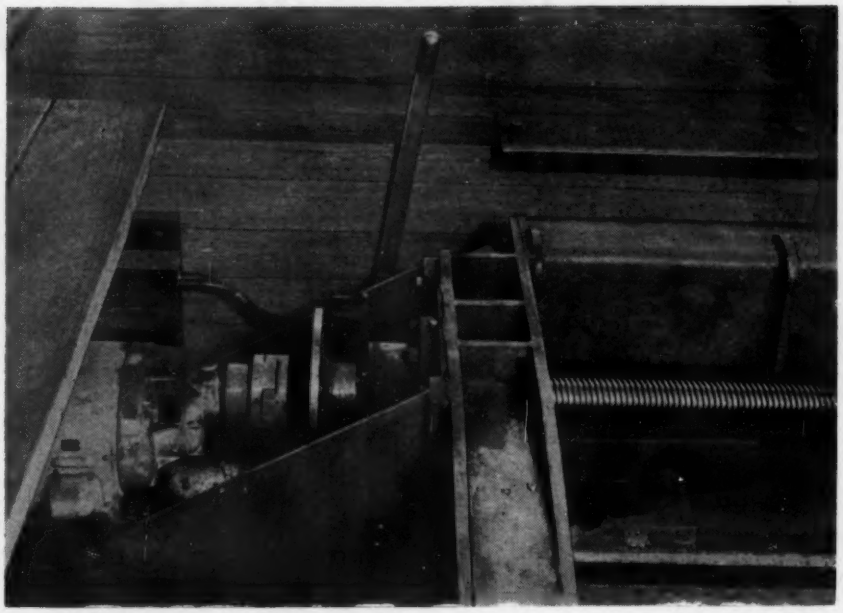
The screw on which the Varidrive feed motor propels the table during the cutting operation is held stationary during that cycle. To return the table a gearmotor rotates the screw and returns the carriage rapidly to a new cutting position.

Cast Cutter Head

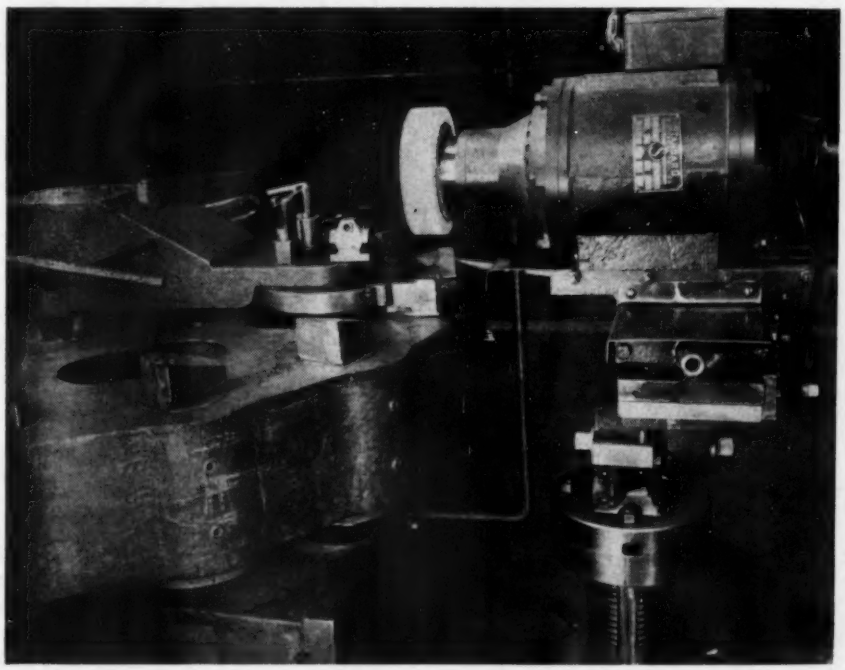
Design of the massive cutter head and the toolholders is probably the most ingenious part of the entire Hendy "windmill" milling machine. The head is cast of Meehanite, and 16 holes are cut through the casting on a 37½-in. circle for the cutter holders. These holes are 3½-in. in diameter, and the thickness of the head is 6 in., giving extreme rigidity to the cutter shanks even when they are new with a 4 in. projection. Stellite tips, brazed to the shanks, are ½ in. thick and 1 in. wide.

When the cutting tips are worn to the point of requiring grinding, the entire head is removed and a second head put in its place to eliminate lost time on the machine. A special grinding fixture was developed by the tooling department to grind the Stellite-tipped cutters. Again parts from the Liberty engine were pressed into service. A high pressure cylinder forms the base, part of a thrust bearing shaft is centered in the cylinder casting for alignment of the cutter head, and the grinder is mounted adjacent to the fixture. Relief angles are read on calibrated scales of the grinder; the entire unit is immediately adjacent to the milling machine.

A procedure of importance to the high production rate of the "windmill" is the use of fixture plates for aligning the columns, prior to their delivery by crane to the mill. It requires only 5 min. to locate the fixture plate on the table of the milling machine. As each column is finished, another is ready to take its place on the table, completely aligned on its own plate.



The longitudinal screw is stationary during the feed cycle, but a clutch throws it into mesh with a gearmotor for rapid traverse on the return stroke



Part of the design is a tool grinding device that sharpens Stellite tips on the massive cutter

Hard-Facing Hot Trimming Dies

MILD STEEL hot trimming dies which have been hard-faced with Stellite or Lamite around the contour of the trimming edge have three to four times the life of the carbon steel trimming dies formerly used in the forge shop at Crane Company's Chicago plant. These hard-faced hot trimming dies have been used for several years and experience has shown that when the hard-facing is properly applied on correctly designed dies, tool cost per forging trimmed is reduced materially.

Combination blanking and piercing punches and dies for trimming forged gate-valve disk rings the hard-faced around the cutting edges, as are the dies for trimming forged valve bodies and bonnets. Since Crane Company

Fig. 1—Hot trimming dies for the forge shop last longer when the cutting edges have been hard-faced. Die plates and punches can be made of SAE 1020 or SAE 1025 machine steel

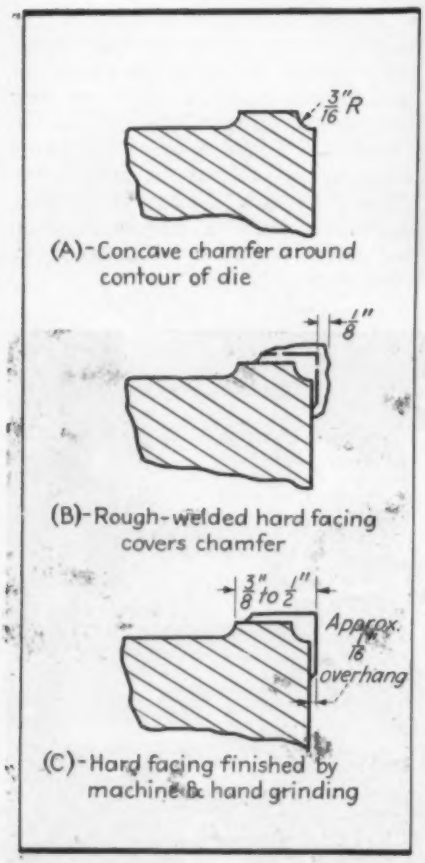

3/16" R
(A)-Concave chamfer around contour of die
1/8"
(B)-Rough-welded hard facing covers chamfer
3/8" to 1/2"
Approx. 1/16 overhang
(C)-Hard facing finished by machine & hand grinding

Fig. 2—When using No. 6 Stellite for hard-facing, a 3/16 in. concave chamfer is milled around the die contour. The hard-faced edge shown at C has a hardness that is considerably more than 300 Brinell

manufactures large quantities of forged steel valves, the development of long-life trimming dies has been essential. Designs of trimming dies which have been found satisfactory for these parts are shown in the accompanying illustrations.

Where Strippers Are Used

While the combination blanking and piercing die shown in Fig. 1 does not have a stripper plate, it has been found best to incorporate strippers where cutting edges are provided on both the punch and the die itself. Such a design is shown in Fig. 3.

In Fig. 2 are illustrated the three steps followed in producing hard-faced trimming dies. The mild steel plate varies from 1½ to 2½ in. thick, depending upon the size of the forging to be trimmed and the contour of the die. The die contour is machined approximately 1/16 in. larger on each side than the contour to be trimmed in order to provide clearance under the hard-facing, which projects over the edge of the die contour. In the case of inner die rings for combination blanking and piercing die steps, the outside diameter is approximately ⅛ in. smaller than the circle to be trimmed by this die. The last machining operation on the die plate consists of milling a concave chamfer around the contour, as shown at *A* in Fig. 2, to provide space for the hard-facing material. When No. 6 Stellite is to be used, the chamfer has a 3/16 in. radius cut around the contour.

Preheating Is Important

The life of hard-faced hot trimming dies is largely dependent upon the quality of the hard-facing operation. Before hard-facing, the die section must be preheated carefully with city gas torches, or in a furnace if the sec-

tion is large. When No. 6 Stellite is to be applied, the section should be brought to a red heat, approximately 1,200 to 1,400 F., before Stelliting.

When preheated to the proper temperature, the part is placed on a brick-top welding stand and is covered with sheet asbestos to delay cooling. Since hard-facing is more like soldering than welding, it is essential that the die material be kept at a proper temperature while the facing material is being melted and run over the contour. For this operation, an oxyacetylene torch is used, with the flame made slightly reducing. When applying No. 6 Stellite, the parent metal should have a "soapy" slick appearance on the surface to which the hard-facing material is being applied.

To keep air away from the surface being hard-faced, it is best to keep the die covered with asbestos, except the small section on which the welder is working. When large die sections are being hard-faced, it sometimes is necessary to reheat them once or twice in order to keep the temperature at the proper level. Also, it sometimes is necessary to reheat large pieces after all of the hard-facing has been applied, in order to insure an even temperature all around the die contour before starting the cooling cycle.

Because the hard-facing material has a very low coefficient of expansion as compared with the machine steel die plate or ring, it is essential that cooling be done slowly to avoid cracks in the hard-facing. When the sections are not too large, they are placed in lime or powdered mica and allowed to cool for 24 to 36 hours. Sections for the larger trimming dies frequently are furnace cooled under automatic control.

As indicated at *B* in Fig. 2, about ⅛ in. excess hard-facing material is applied to insure clean metal when this facing has been ground to size, as shown at *C*. The top surface of the hard-facing is surface ground flat without any back-off from the cutting edge.

Several of the dies used by the Crane Company for trimming cast-steel and forged valve bodies serve to show how hard facings are applied to obtain low tool cost per piece

The vertical surface around the contour is hand ground with a 3-deg. relief angle. It should be noted that the hard-facing material projects approximately ⅛ in. above the proper surface of the die and over-hangs the contour of the die approximately 1/16 in. Flash clearance is provided by milling away the top surface of the die plate to a depth of ¼ to ⅜ in., leaving a projection approximately ⅜ to ½ in. wide around the die contour.

Guides Locate the Piece

In Fig. 3 is shown the assembly of a combination blanking and piercing punch and die set for trimming disk rings for 10-in. cast steel gate valves. It will be noted that a tool steel punch ring is used. This is an alternate design for a hard-faced machine-steel punch ring.

The die unit shown in Fig. 3 differs from that shown in Fig. 1 in that a stripper is used and three machine-steel guides are employed for properly locating the blank for trimming. This assembly is designed for use in a crank-type trimming press. It will be noted that the inner die ring and holder are lifted out of the assembly to permit removal of the trimmed disk, which drops into a cylindrical cavity *A* in the die box after the punch has forced the ring past the hard-faced inner and outer die rings.

The punch and die shown in Fig. 4 are for finish trimming a 2-in. forged steel angle valve body. The die assembly consists of an upper and a lower die plate which are fitted together as shown and then mounted on a cast-steel trimming box like that shown

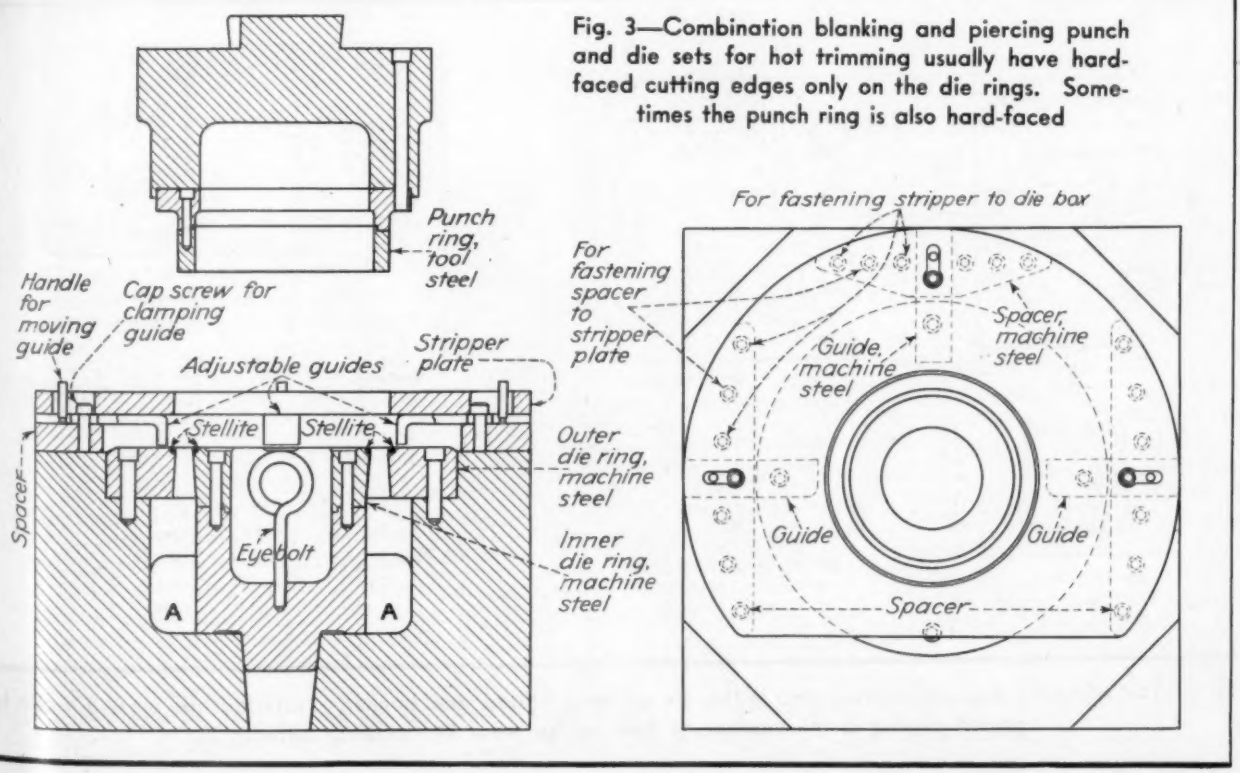


Fig. 3—Combination blanking and piercing punch and die sets for hot trimming usually have hard-faced cutting edges only on the die rings. Sometimes the punch ring is also hard-faced

supporting the trimming die in Fig. 1. Only the contour of the upper trimming die plate is hard-faced. The punch, which is machined to fit the profile of the forging, clears the die contour by a considerable amount. This punch does no cutting. It simply pushes the forging past the cutting edges on the contour of the die plate. In trimming with this type of a die, it is essential that the punch push the forging through the die evenly if a clean trim is to be obtained, and if satisfactory die life is to be experienced.

A somewhat different type of hot trimming die assembly is shown in Fig. 5. Here, the part to be trimmed is a forged bonnet for 1-in. forged alloy steel globe and angle valves. There are really two trimming dies with their related punches in this assembly. The first of these punch and die sets is for trimming the flash from the body of the bonnet. This die is shown at *B* in Fig. 5. The forging is then placed in a punch plate cavity in the die, and a tool steel punch with Stellite cutting edge is forced through the oblong hole. This part of the die is shown at *A* in Fig. 5. The die itself does not cut; it serves only to locate the forging under the punch, and to strip the forging off of the punch on the return stroke of the ram. After trimming and punching, the forging is returned to the hammer for restriking.

The trimming die plate shown at *B* in Fig. 5 also is of interest because it is split along the line *X-X*. The two halves of the die plate are kept in alignment by the dowel pin shown. This die plate is split so that the surfaces *Y* can be ground to close in the die contour after it has worn to a point where it is not trimming the forging close enough to size. The split-type of trimming die can be used where the forging has a relatively regular contour. It would not be satisfactory, for example, for a trimming die like that shown in Fig 4, because of the section which projects into the large cavity of the die. While the split type of die warps more than the solid type, it is easier to machine and does not require refinishing as often.

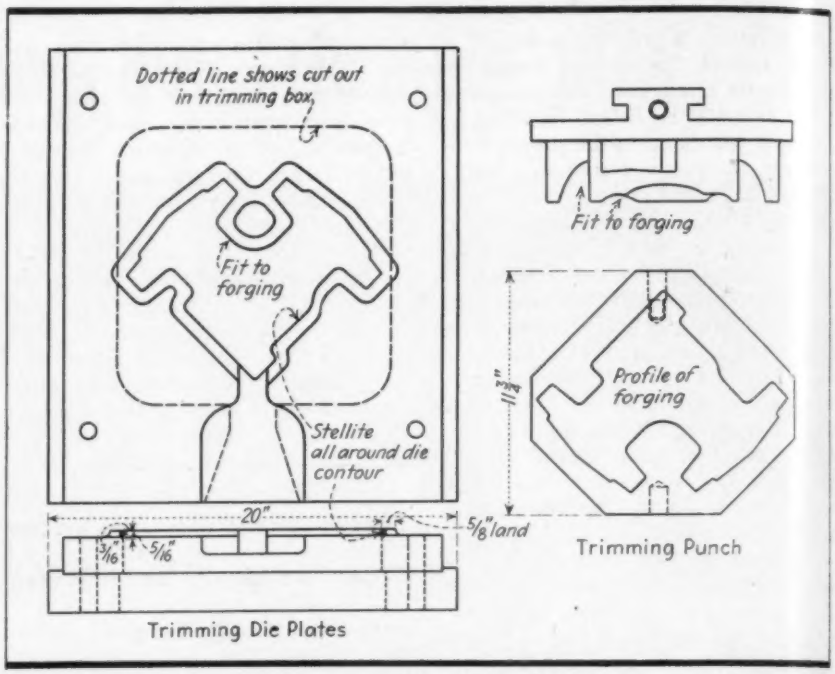


Fig. 4—Solid trimming dies are employed when there is a projection in the contour, as shown above. In a die set like this the punch is somewhat smaller than the die and does no cutting

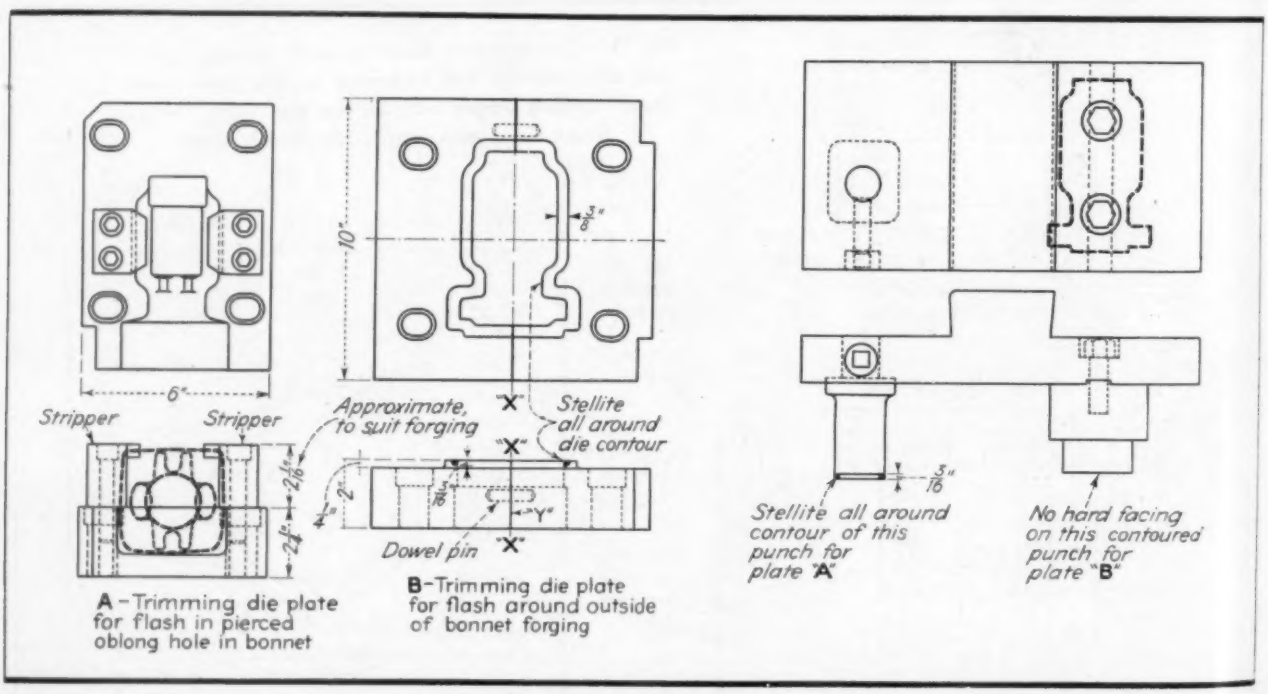
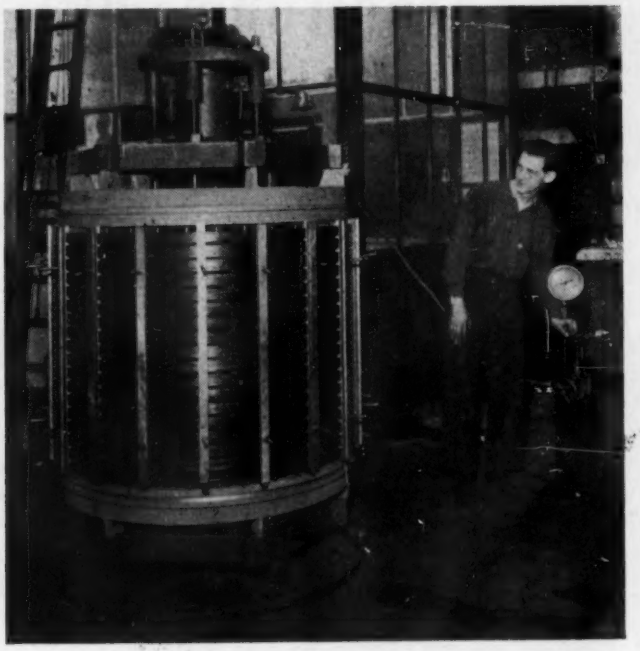


Fig. 5—Two trimming dies are incorporated in this die set for a forged steel bonnet. Note that die plate B is split to permit closing in the contour to take up for wear by grinding surfaces Y

Close-Quarter Stator Stacking

BY J. E. WAUGH, SCHENECTADY WORKS, GENERAL ELECTRIC COMPANY

It is no trick at all to stack stator punchings on a mandrel fitted with aligning ribs. This assembly will include 22,000 segmental punchings

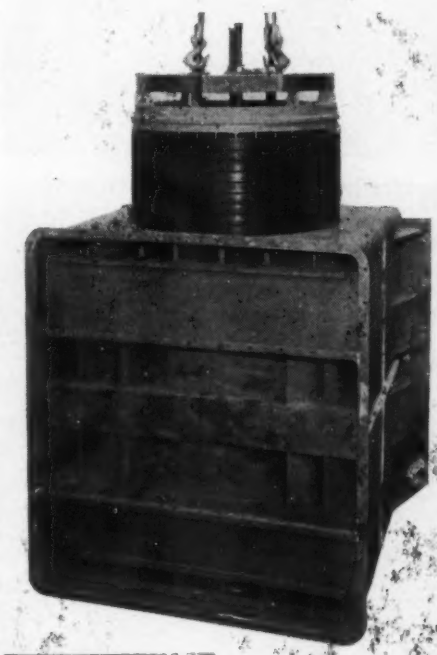


An hydraulic jack is placed between the pressure plate and the upper clamping plate to compress the stacked punchings to the required overall dimension

Large punching assemblies with a core too small for a man to work inside can be made on a two-piece mandrel

WHERE THE INSIDE DIAMETER of silicon-steel stator punchings is so small that an operator would have difficulty in working inside the core, a method devised by the Schenectady Works speeds the stacking operation. This method combines the features of two standard stacking practices: (1) stacking punchings on ribs aligned in the frame, as is done with large-diameter stators, and (2) stacking punchings on a mandrel along with the side plates and bolting the assembly together before removal from the mandrel, as practiced for small-diameter stators of short stacking length.

The new method has been applied successfully to the problem of stacking 22,000 segmental punchings, with an inside diameter of 2 ft., to a height of 32 in. It consists essentially of stacking the punchings around a mandrel fitted with master aligning ribs, compressing the punchings between through-bolted side plates and transferring the assembly to a stator frame fitted with machined ribs.



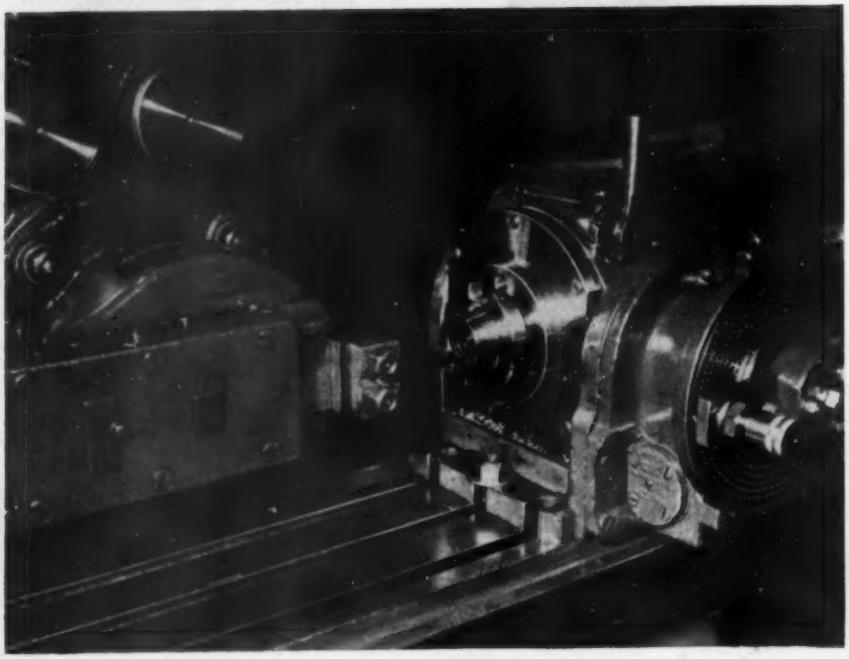
The stator core is dropped into the fabricated frame, alignment being taken by ribs welded into the latter and engaging the previously aligned slots in the punchings

The stacking mandrel is built in two pieces that taper toward the center to permit easy removal from the punching assembly by means of hydraulic pressure. One side plate is put over the mandrel, the punchings are laid progressively in place, being positioned by the aforementioned ribs fastened to the mandrel, and by loose ribs at the circumference of the stack. Then the other side plate is placed on top and through bolts are put through the loose assembly. These bolts extend far enough above the upper plate to mount a pressure plate, with sufficient space underneath for insertion of an hydraulic jack. As the assembly is pressed together, nuts are tightened against the upper clamping plate. A pressure gage in the hydraulic-jack circuit assures attainment of the desired clamping pressure on the assembly. The assembly is then removed from the mandrel and transferred to a stator frame.

Toolroom Milling Practice—II

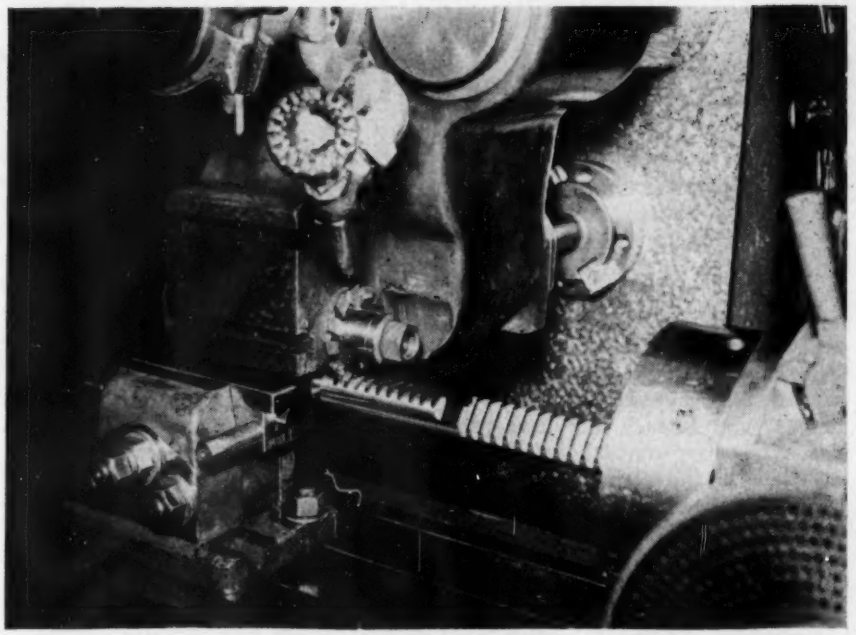
BY H. A. FROMMELT, KEARNEY & TRECKER CORPORATION

Quill racks can be cut on the milling machine. The quill shown is made of SAE 1020 steel, and the rack is 5 pitch, right-hand, single acme thread with a 200 lead and a depth of 0.142 in. The helix angle is 2 deg. 15 min. The worm for the rack is 1.510 in. diameter. The form cutter used is 1.530 in. diameter, or 0.020 in. larger than the worm to allow for clearance at the bottom of the thread. The head of the universal attachment is set at the helix angle of 2 deg. 15 min. The table is adjusted until the cutter just touches the quill as the table is moved crosswise. The spindle speed is set at 123 rpm, and the quill is fed into the cutter 0.137 in., leaving 0.005 in. for a finish cut. Since the worm is 5 pitch, the distance between threads is 0.200 in.; hence, the table is raised 0.200 in. for milling each successive thread.

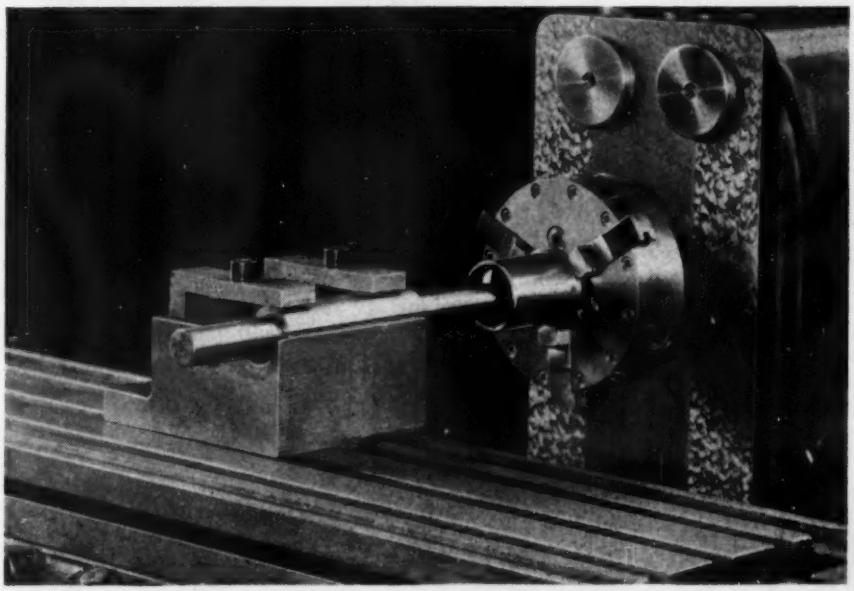


Slotting keyways in adapters is done on a horizontal miller equipped with a slotting attachment supported on the over-arm and powered through the spindle of the machine. The length of ram travel is set by an adjustable eccentric. The maximum stroke on the model shown is 4 in. The travel required for slotting the keyway in this adapter is 3 in. The adapter is held in a dividing head so the tool and workpiece can be positioned quickly and correctly. This is done by indicating the surfaces of the slots in the collar of the adapter, and making the necessary adjustment with the dividing head. The ram of the attachment reciprocates in a horizontal plane for this job: however, it can be set for milling a slot at any angle, using the graduated base on the head of the attachment.

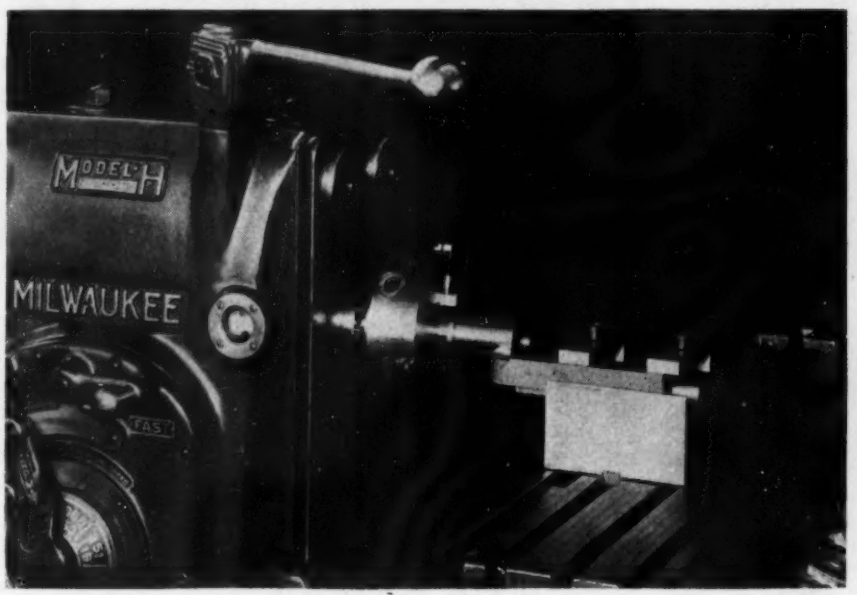
Pinion racks having two sets of teeth are set up between a dividing head and a tailstock, and are cut with a thread milling attachment. The workpiece shown is designated as an eight-pitch rack, that is, the pitch of the mating pinion is eight. The circular pitch, or distance from tooth to tooth, is 0.393 in. This establishes the distance the machine table is moved longitudinally for cutting each tooth. A 3-in. gear cutter, with tooth dimensions corresponding to those of the mating pinion, is used. It is revolved at 136 rpm, and the feed is 7¼ in. per min. Two cuts are taken, the second a finishing cut of 0.010 in. The angle between the axes of the two sets of teeth is 34 deg. 15 min.; hence, the dividing head is necessary to index the workpiece through this angle.



Boring operations are performed easily on the milling machine by holding the workpiece in a chuck mounted on the spindle. The toolholder here is of box design and has a groove and tongue for accurate location in a table slot. A tungsten-carbide toolbit is being used, and is fed into the workpiece by the cross-feed of the machine. High spindle speeds, 1,000 rpm in this instance, make possible the boring of bushings to limits of 0.0002 in. The machine should be in good adjustment, particularly the table gibs, for high accuracy and finish.



Turning operations can also be performed on the milling machine. As in boring operations, the workpiece is held in a chuck mounted on the spindle. The toolholder is of box construction, grooved and tongued for location in a table slot. Two strap clamps hold the turning tool. The table cross-feed is used to advance the tool. The 4-in. bushing being turned here is run at 1,000 rpm. With gibs properly adjusted, and using the correct feeds and speeds, high finish and accuracy to within 0.0002 in. can be produced by this method.



Supervisory Training Is Given New Foremen

"How to be a Good Boss" is the theme of an instruction program being conducted by Training Within Industry, designed to help develop skill in handling people, sizing up situations, getting team work and developing workers

THROUGH JOB RELATIONS TRAINING, third portion of War Manpower Commission's Training Within Industry program, supervisors in General Electric Company's Bridgeport, Connecticut, plant are being taught to solve personnel problems with regard to the desire for greater production. "Operators are human beings," they are taught, "and as such they have feelings. They have contacts, both inside the plant and out, that affect their productive capacity. When an operator needs correction, consider the goal you wish to attain before deciding upon the action to take."

Rapid expansion of war production has seen the addition to factory personnel of thousands of green operators unfamiliar with production routines and customs. They may require more careful supervision than their more experienced coworkers. At the same time, many experienced operators, with no previous supervisory background, have been promoted to oversee the work of these new employees; many of them lack the instinctive ability to handle subordinates. Add to this thousands of experienced foremen faced with the problem of attaining and maintaining peak production, while labor supply is inadequate and the output need is high.

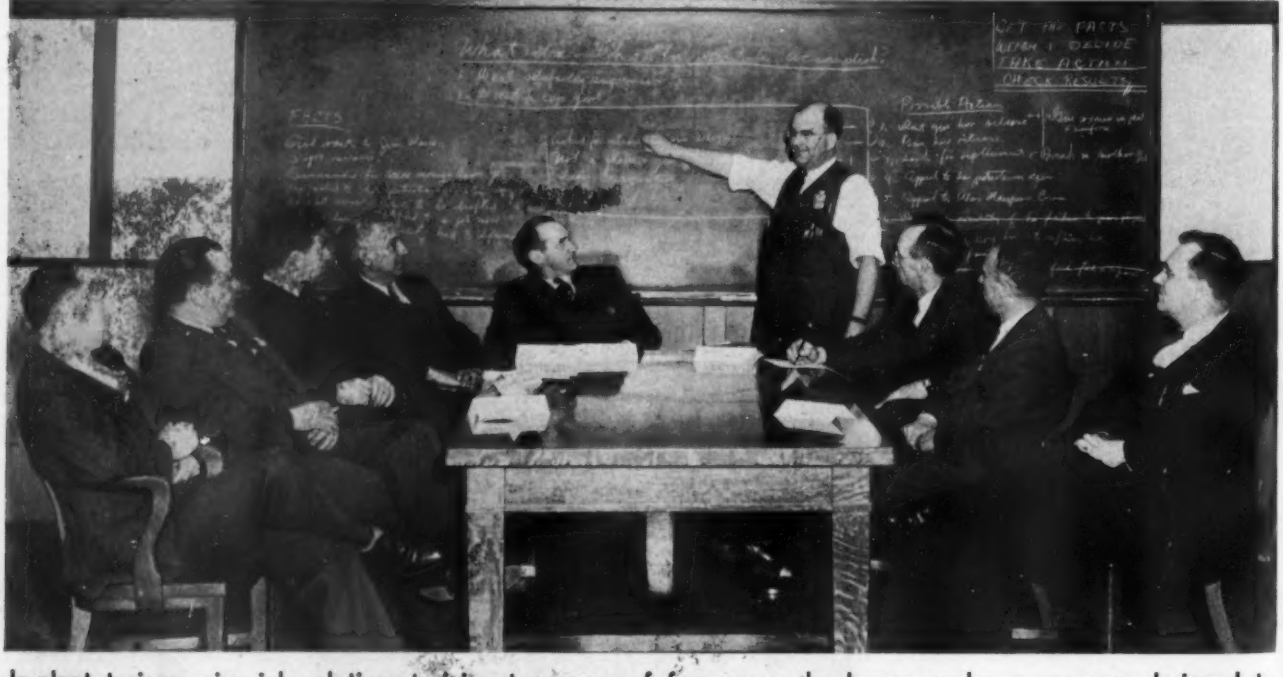
The composite picture emphasizes the importance of handling workers with care and consideration. JRT is designed to teach supervisors to handle personnel. It furnishes them a pattern to think by and gives them confidence in their final decisions. Supervisors who have taken the course express the belief that it will help them to head off problems before they arise.

During the organization of Training Within Industry, and the instituting of its first and second courses, Job Instructor Training and Job Methods Training, the country was divided into districts and a job institute conductor was appointed in each. In the New Haven district, John McCarthy, supervisor of training, personnel department, General Electric Company, Bridgeport, was named.

To get the third portion of TWI started, Mr. McCarthy and other job institute conductors from the area attended a one week master institute in Washington.

Returning to Bridgeport, Mr. McCarthy conducted an institute for ten potential in-plant trainers, preparing them for the task of conducting training courses for supervisory personnel in their own plants. Of the ten, four were General Electric employees; the balance were drawn from other plants in the area.

Thereafter, each in-plant trainer began teaching groups of ten foremen or lead men, conducting each group through five 2-hour classes. It has been suggested that ten percent of each factory's enrollment be given JRT, and, on this basis, each plant can determine the number of trainers that it will need to spread the teaching to them. The number of trainers should be kept at a minimum, TWI officials recommend, to insure a higher quality trainer, and because as each handles a larger number of groups he becomes



In-plant trainers give job relations training to groups of foremen or lead men, under a program designed to instruct at least ten percent of each factory's enrollment. Trainers promote class discussion, encourage trainees to reach proper decisions through their own thought processes

more capable and the quality of training improves.

Teachers are chosen for their talent as quick thinkers, for their resistance to any desire to dominate the discussion and their ability to draw out students. It is the teacher's job not to dictate the action a student should take when faced with a given set of circumstances, but to channel his thinking so that he will be able to properly arrive at his own decisions. While not necessarily an industrial man, the trainer should know the problems of a foreman and should know how people in industry react to situations. He must have a sincere respect for the complexities of a foreman's job, and must not treat them with condescension.

Discuss Typical Cases

The course consists of five 2-hour sessions on consecutive days. Of these, the instructor spends the first establshing the mode of thinking. The next three are divided equally between participation by the instructor, who presents a typical case each day, and the students who are each required to bring in a case. The instructor's cases are designed to emphasize a different basic point each day.

As each member presents the case he has to offer, he gives the facts only, leaving it to the class to discuss it, question him for further information, and decide upon the best possible courses of action open. If the case is one the foreman has already handled and closed, he knows deep inside him whether or not his action was the right one; in many instances a supervisor-student returns to his seat with the feeling that he "muffed one." In other cases, where the situation had been handled in keeping with one of the solutions advocated by the class, he admits with obvious pride that he took one of the possible actions the group had suggested.

The fourth day of the course is divided between handling the balance of the cases assigned to group members and to emphasizing that not only are supervisors' relations with operators important, but so are the relations with other supervisors, other departments, their own superiors and other agencies.

The fifth, and final day, is concluded by polling the group to establish the fact that a large number of people are supervised by the members thereof, and that anything that affects that many people must be important to plant production. It is emphasized that production is the foreman's responsibility and that everyday relationships and his ability to handle them will determine to what extent he is able to meet these responsibilities. The course closes with a short, terse, patriotic appeal for more production through better relations.

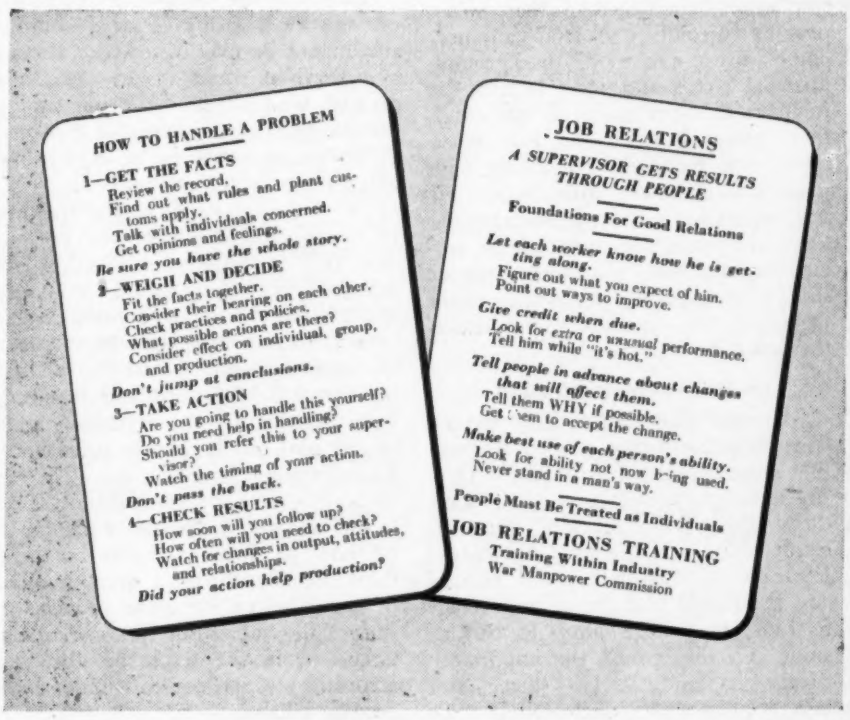
The precepts of the course are concisely given on a 2½×4 in., wallet size, card furnished to each student. One side of the card is headed, "How to Handle a Problem," and outlines the proper steps to follow. The other side, headed "A Supervisor Gets Results Through People," gives the "Foundations for Good Relations." The entire course is based on this printed card, and students are advised to keep it, follow its precepts.

First of the four major items under "How to Handle a Problem" appears the admonition, "Get the Facts." The student is taught, when faced with a situation demanding corrective action, to stop and get all of the pertinent facts, and then to proceed through the use of his reason, rather than emotion. He is advised to review the worker's record, to find out what rules and plant customs apply, to talk with individuals concerned and to get opinions and feelings, and to *"be sure to have the whole story."*

Such an approach helps him to think not only of the immediate cause of the trouble, but also to think of all the good things about the operator concerned. It causes him to look upon each of his subordinates as an individual, with his own characteristics and differences, private life and outside influences. Throughout the study, the supervisor is encouraged to search for the underlying and motivating cause for the operator's frame of mind.

The second major item advises "Weigh and Decide." Thereunder are terse sentences: "Fit the facts together. Consider their bearing on each other. Check practices and policies. What possible actions are there? Consider effect on individual, group and production. *Don't jump at conclusions."* Emphasis on this portion makes the foreman realize there are a great many possible actions that can be taken when faced with any set of circumstances. It helps him to analyze those possible actions by checking against the facts, to see if justified or warranted. Then it helps him to check the efficiency of each possible action toward attaining the desired results It makes him consider both the short term and the long-range effects of his action on the individual, the group, total production and his own relationship with his entire department.

The third major item, "Take Action," raises three pertinent questions: "Are you going to handle this yourself? Do you need help in handling? Should you refer this to your supervisor?" He is admonished to "Watch


HOW TO HANDLE A PROBLEM
1—GET THE FACTS
Review the record.
Find out what rules and plant customs apply.
Talk with individuals concerned.
Get opinions and feelings.
Be sure you have the whole story.
2—WEIGH AND DECIDE
Fit the facts together.
Consider their bearing on each other.
Check practices and policies.
What possible actions are there?
Consider effect on individual, group, and production.
Don't jump at conclusions.
3—TAKE ACTION
Are you going to handle this yourself?
Do you need help in handling?
Should you refer this to your supervisor?
Watch the timing of your action.
Don't pass the buck.
4—CHECK RESULTS
How soon will you follow up?
How often will you need to check?
Watch for changes in output, attitudes, and relationships.
Did your action help production?
JOB RELATIONS
A SUPERVISOR GETS RESULTS THROUGH PEOPLE
Foundations For Good Relations
Let each worker know how he is getting along.
Figure out what you expect of him.
Point out ways to improve.
Give credit when due.
Look for extra or unusual performance.
Tell him while "it's hot."
Tell people in advance about changes that will affect them.
Tell them WHY if possible.
Get them to accept the change.
Make best use of each person's ability.
Look for ability not now being used.
Never stand in a man's way.
People Must Be Treated as Individuals
JOB RELATIONS TRAINING
Training Within Industry
War Manpower Commission

A pocket-size card, blue, printed on each side, is given each trainee. On it appears an outline of the course. It serves as a constant reminder of the teaching, and as a guide for future actions

the timing of your action and *don't pass the buck.*"

Foremen—being only human, after all—are often prone to act immediately on impulse. JRT teaches them that acting without all the facts may well magnify an otherwise insignificant situation. Each is taught first to stop and ask himself "What do I want to attain?" In terms of this war of production, his answer will probably be, "Increased production." Each of his actions thereafter — seeking facts, weighing them and deciding the action to take—should be directed to gaining that increase in production.

The fourth and final major portion of this side of the card, "Check Results," advises a follow-up to ascertain whether the desired results were attained, and asks the question that is, after all, the crux of the problem, *"Did your action help production?"*

The propriety of the action he decides upon will be proved by the attainment of the desired increase in production and by its effect upon job relations between him and the individuals involved. If his action meets these requirements, he can rest assured that it was the right action.

This portion of the course gives a supervisor the necessary foundation for good relations. It stresses the fact that he gets results through people, and impresses upon him that people must be treated as individuals. It emphasizes the factors that make people different, one from another: home life, education, background, financial status and job. It tells the foreman that operators do not check their personalities at the gate when they come to work, but bring with them all of these differences. He learns that while these personal problems ordinarily are none of his immediate concern and their privacy should be respected, when they begin to affect the operator's production they must be considered.

Attentiveness is Stressed

The supervisor learns how to obtain the information needed, following a set of rules furnished by JRT. These rules are simple: *Listen;* don't do all the talking yourself; don't interrupt; don't argue; don't just agree; let the individual talk about himself and the things that are of importance to him; and don't jump to conclusions. Of this group, the importance of the first and the last—listen, and don't jump to conclusions — are stressed, for the former takes care of the intervening five.

By listening, the foreman often finds that an individual relishes the opportunity to get a load off his chest. Frequently the individual is troubled about some problem that has nothing to do with his work; having had the opportunity to unburden himself to a sympathetic listener, he is in a frame of mind to discuss the problem of the moment in a rational way. The foreman is then able to get the operator started toward overcoming the fault which caused the interview.

JRT is designed to furnish supervisors with a foundation for good relations, and to assist them in preventing many problems from ever arising. By letting each worker know how he is getting along—by letting him know at once when he digresses slightly—he may be prevented from going seriously astray. Giving credit when due, in manners best suited to the individual recipients, will help morale. It should be remembered that encouragement should be extended occasionally to the large group of average workers, and not limited to the small minority of poor ones.

Must Recognize Inertia

People should be told in advance of any anticipated changes that will affect them. This practice is of value, inasmuch as most humans resist change. When long-range warning is not possible, they should be told as early as possible with careful explanation of the need for the change.

The best use should be made of each person's ability. Special abilities should not be overlooked, nor should a supervisor stand in an operator's way or hold a man on a job simply because he is highly expert at that one. A worker on a task he believes below his abilities won't do his best.

Of particular value to the training of newly created supervisory personnel, JRT is designed to teach them practices that they would ordinarily acquire only through experience. It is emphasized that the course gives the supervisor but a start in developing the skill of leading and that only by practicing the fundamentals taught him can he obtain proficiency. This thinking is driven home in the 10-hour course by comparing classes to the boy who memorizes a handbook on how to throw a curve, but who must actually throw a great number of them before he gains proficiency. Before the supervisor has gained the utmost from the teachings, thinking according to its precepts must have become a habit.

In much of the teaching, the practice of medicine is used as an illustrative parallel. Supervisors habitually prefer to handle their problems alone, but JRT urges him not to feel shame in turning to a colleague or superior for consultation when he fails to solve a problem alone. In line with this teaching, he is compared to a doctor who, despite years of study and practice, fears no loss of prestige or patient-respect through seeking the advice of specialists.

The plan does not rule out the need for firing some operators, but it does emphasize that such a step should be considered in the greatest detail. The supervisor should realize that firing a worker who is temporarily "off the beam" may have widespread effects on the man, his family and society.

On the other hand, JRT does not weaken a supervisor through making firing more difficult. Instead, it makes him stronger than ever, because he will have weighed every possible aspect of a situation before going ahead on what he knows to be the only course. His authority is not weakened through retarding his tendency to take disciplinary, rather than corrective action.

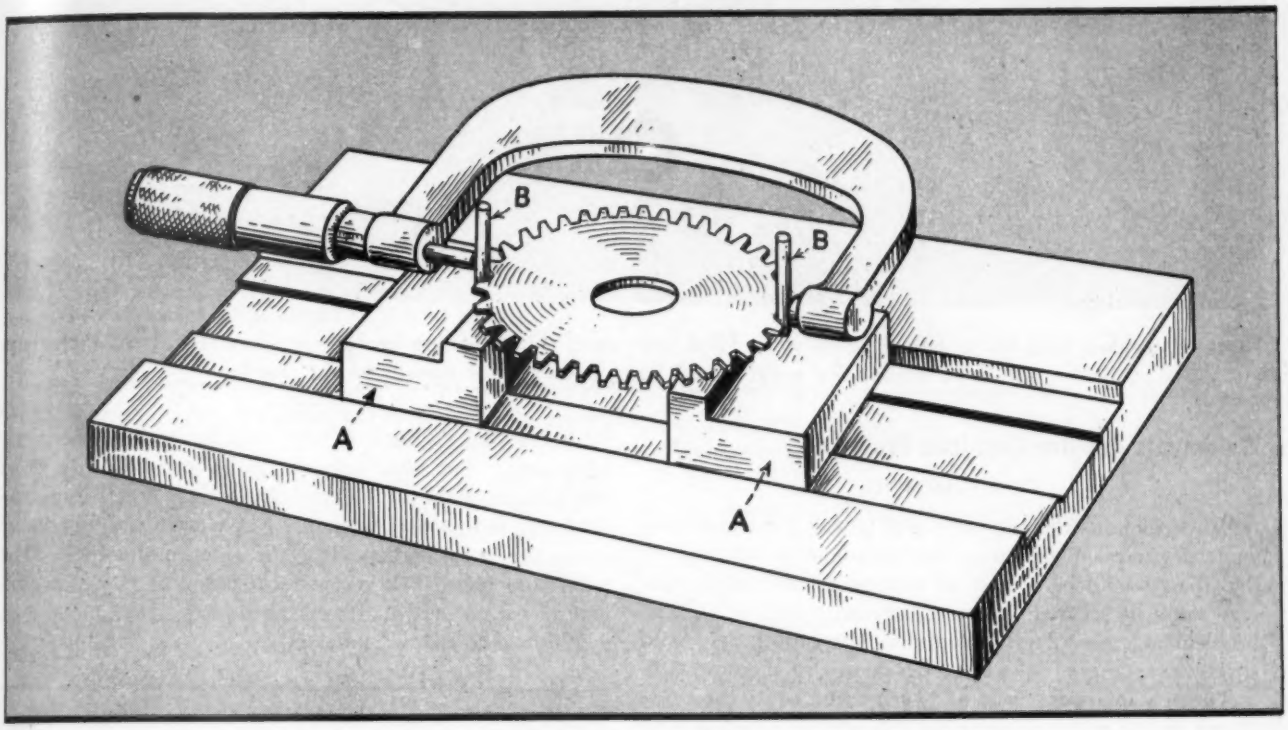
Foremen who have taken the course have said it is already aiding them. They say they can see improvement of their abilities to pick out facts, to weigh them, to place emphasis on facts previously considered insignificant and their inclination to search for the cause of a situation rather than to accept the mere surface expression. Many of them think they should get together more often to discuss their problems.

Present plans call for meetings at regular intervals to discuss current cases. In the discussions, locations and identities will be changed, and the facts and their solutions will be tested against the JRT pattern of thinking. Each session will be concluded by a short review of the steps outlined on the wallet card. It is expected that these sessions as part of the over-all supervisory training program, will meet five times yearly.

Job Relations Training will be given to all supervisors and potential supervisors, including office supervisory forces, from group leaders and salaried assistant foremen upward.

When a new machine is delivered, say those conducting the course, there comes with it an instruction book, or even a mechanic to instruct in its handling. Not so with a new employee, the most complex cog in our production machine: his parents or wife do not come along to explain just how much strain he'll stand, where to "oil" him, or how to handle him to get the most production. It's into this niche that JRT fits, offering training in how to be a good boss.

Ideas From Practical Men



Wires used to measure pitch diameter of gears are placed in the sliding blocks of this fixture. The inspector can use both hands to adjust the micrometer

Fixture Speeds Wire Measurement of Gears

BY BARNEY BERLINGER

The measurement of gears by the wire method is often difficult and may be susceptible to error unless the wires are held parallel. To prevent such error, as well as to eliminate the annoyance usually accompanying such work, we designed the illustrated fixture to hold the wires. It is comprised of two sliding blocks *A* with pin holes drilled to accommodate various sizes of wires *B* needed to measure gears.

Three sets of sliding blocks will cover a wide range of wires, since the holes in the blocks are oversized about 0.010 in. for alignment purposes. When using the fixture, the inspector has both hands free to adjust his micrometer. Helical gears can also be measured by this method by drilling holes for the wires on an angle to suit the angle of the teeth. The fixture is especially useful when measuring thin gears.

Heat-Treatment With Boric Acid

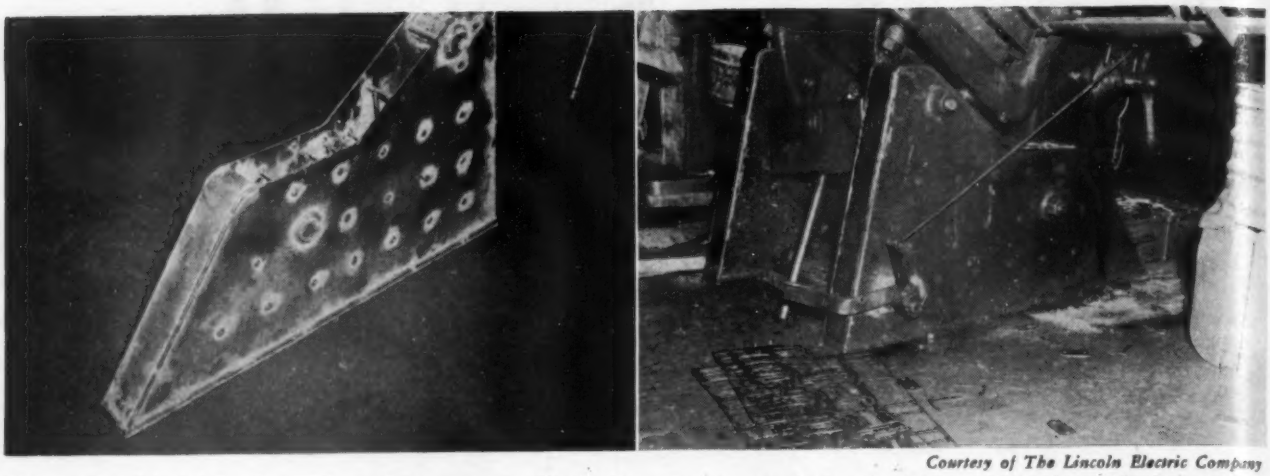
BY J. H. SPERMAN

When heat-treating steel, especially those of high alloy content, in small shops, difficulty is often encountered in preventing distortion and scale formation. In an effort to eliminate this, I have experimented with different substances packed around the steel, and have finally standardized on boric (boracic) acid. This can be used for oil- or water-hardening steels, as well as high-speed steel. It imparts a clean gray finish to the work with less distortion than normally found, and it makes the steel two points harder on the Rockwell scale. Furthermore, the work expands about 0.0002 to 0.003 in., with holes getting smaller the same amount.

The procedure used is as follows: Place the work in a pan with the boric acid piled around and over it, and then heat it to the correct hardening temperature and plunge it into its quenching medium. When plunged into water, the work comes out clean. When oil quenched, some of the boric acid clings to the work, which can be dissolved by placing the work in a pan of boiling water.

In following this procedure it is important that the boric acid cover the work; otherwise, it will etch into the work at its junction line with the air. When the boric acid reaches a temperature of 700 F. it starts to bubble and swell, giving off mildly disagreeable fumes. This continues until a temperature of about 1,100 F. is reached, when the covering collapses around the work and forms a hard protective coating. The work sticks out of the boric acid at this stage, but this has no detrimental effect since the protective coating has been formed. It is very easy to polish off the gray coating before tempering.

Small work can be placed in small pieces of pipe when hardened by this method. The pipe should be capped at one end, and fitted with a loose cold-rolled steel plug at the other. For large work, use a pan with sides as high or higher than the work.



Courtesy of The Lincoln Electric Company

These all-welded legs for a heavy press were filled with concrete, replacing broken cast-iron legs. Had these legs not been made, the press would have been out of operation for months

Weldments Replace Cast-Iron Press Legs

BY J. R. MORRILL

When the cast-iron legs of a large punch press in a mid-western war plant gave way due to fatigue, it was learned that there would be a delay of several months before new legs could be secured. Shop maintenance men solved the problem in a few days by replacing the broken legs with stronger supports of all-welded design at a total cost of $10.

The new legs were made of 14-gage steel cut to the shape shown in one of the illustrations. A number of holes were drilled through the side pieces and tie studs and heavy press support pieces were inserted through the holes. These were welded into place, both inside and outside. The tie rods are 5 in. long, the width between the two main plates of each leg. Base and side strips were fillet welded into place, using 5/32-in. all-position electrodes for mild steel.

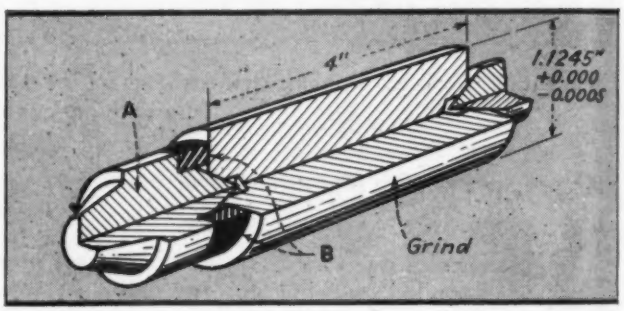
The legs were then filled with a mixture of Portland cement and metallic aggregates. Setting and drying action of this filler resulted in slight expansion, placing the structure in tension and resulting in extremely rigid supports for the heavy press. Top strips were arc welded to complete the fabrication. Operation of the machine on the new welded metal and concrete-filled legs proved them to be more rigid than those of the original cast-iron construction, as well as more resistant to shock loads.

How to Solder Cast Iron

BY A. EYLES

Fractured cast-iron parts can often be repaired by soft soldering methods when correct practice is used. This is desirable, for example, when a broken machinery part is to be used as a pattern for a new casting, thus saving the time and expense of making a wood pattern.

Preparatory to soldering, cast-iron component parts should be cleaned thoroughly by grinding or filing, after which muriatic acid should be applied with a small brush and allowed to remain on the cleaned surfaces for about 5 min. This should then be removed with a stiff wire brush, a zinc-chloride flux applied, and the cast-iron surfaces tinned with solder. This tinning operation is most important—it is advisable to apply the flat face of the soldering tool to the cast iron in order to heat the metal adequately. For large cast-iron parts, it is best to preheat the surfaces with an oxyacetylene torch. When using the soldering tool, some mechanics often make the mistake of using the point, rather than the side of the tool. The writer has found that a solder composed of 60 percent tin and 40 percent lead will hold much better on cast iron than a solder of lower tin content.



A rubber washer compressed between the live center and the shaft is used to drive the latter while grinding

Rubber Washer Replaces Driving Dog

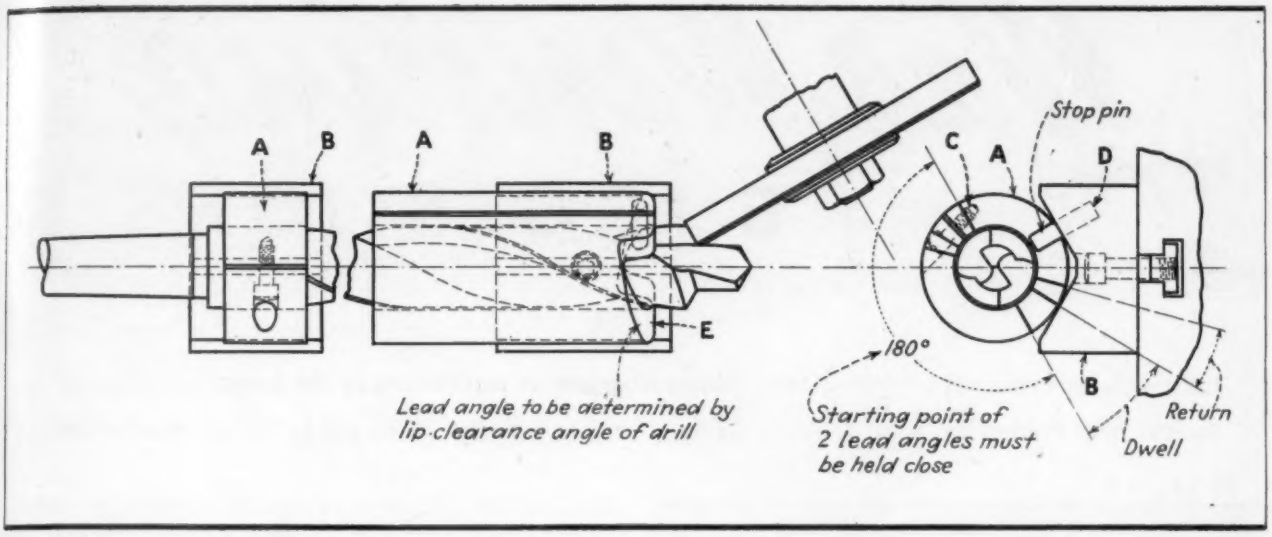
BY F. G. JULYAN

We recently had to grind 50 cylindrical parts 4 in. long, holding the diameter to 1.1254 in., plus 0.000 and minus 0.0005 in. The work was done in a lathe, using a portable grinder. Since it was desired to grind the entire surface in one set-up, and a dog could not be used to drive the part, we machined a recess in live center *A* to receive a rubber washer *B*. When the part was mounted between centers, washer *B* was compressed by tightening the tailstock spindle, thus furnishing enough friction to drive the part while grinding. No difficulty whatever was encountered in holding the diameter to the required limits.

Cam Sleeves Hold Drills for Grinding Sub-Lands

BY G. R. ALLGRUNN

Our cutter grinding department was confronted recently with the problem of sharpening 2-9/16x1-¼ in. sub-land



The lead angle on the sleeve of this fixture bears against a stop pin. As the drill is rotated, the lead angle is transferred to the sub-land while grinding

drills without adequate equipment. As a result, the illustrated fixture was designed to hold the drills in relation to the grinding wheel and produced the required angles. The fixture is comprised of two cast-iron split sleeves *A* and two V-blocks *B*. Both sleeves are bored to a slip fit on the large diameter of the drill, after which they are split, drilled and tapped for tightening screws *C*. The longer sleeve has a spiral cam milled on the end to suit the clearance lead angle of the drill. The short sleeve is tightened on the drill as near the shank end as possible. The V-blocks are located on the table of the grinder to suit the spacing of the sleeves.

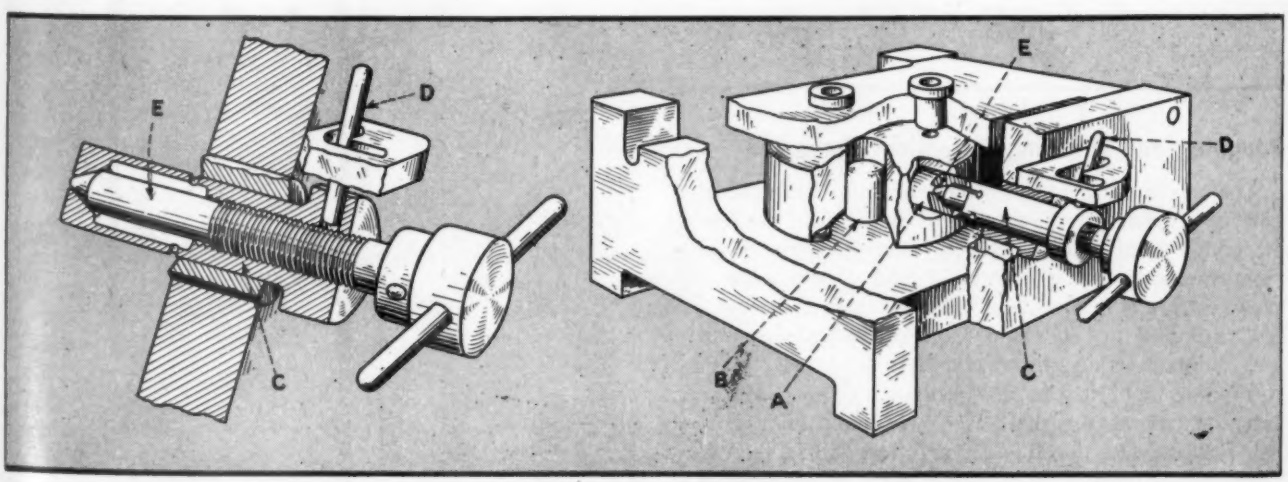
In rotating the drill by hand and keeping pressure between stop pin *D* and cam *E*, the lead angle on the sleeve is transferred to the secondary point of the drill. By feeding parallel to the center line of the drill, the outside diameter of the primary point can be maintained easily. The drill with the bushing assembled has been found to be of sufficient weight to hold it down on the V-blocks without further clamping. The V-blocks are clamped to the grinder table with T-bolts.

Line Reaming Fixture Has Adjustable Locator

BY J. MASSARONI
General Electric Company

The part shown in the illustrated line-reaming fixture is drilled complete in a drill jig, and then line reamed in a subsequent operation. It was essential that the two small holes in the top surface of the part be located accurately in respect to hole *A* in the outer edge, although hole *A* itself did not require a close tolerance on the diameter. The illustrated fixture was designed to locate the top holes accurately for reaming, using hole *A* as the locating medium.

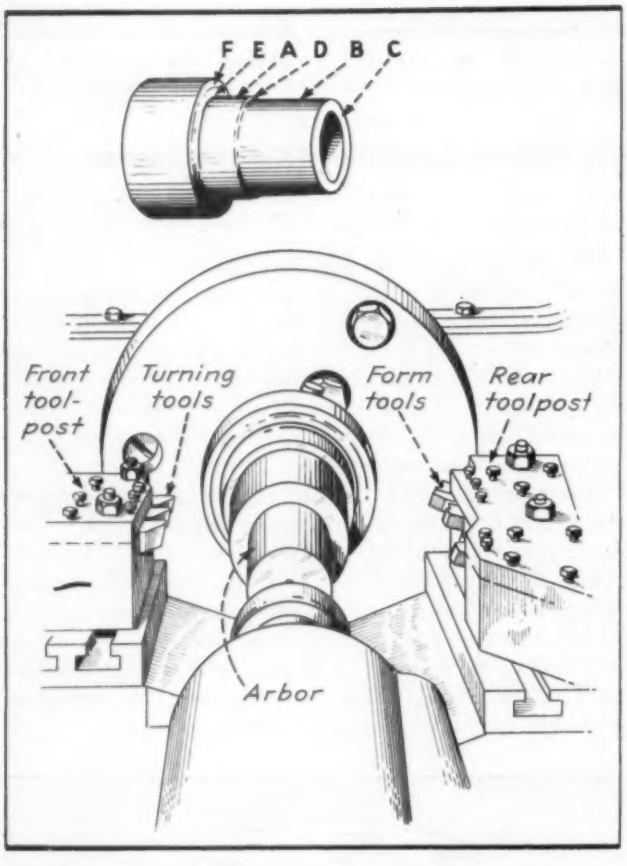
Center post *B* locates the part centrally, and the adjustable locator *C* is used for preliminary radial location. The locator nose is pushed into hole *A* and held there by bayonet lock-in *D*. Expanding screw *E* is then tightened, causing its tapered nose to expand the split end of locator *C* until the latter forms a tight locking fit in hole *A*. Thus, small variations in the diameter of locating hole *A* are accommodated and an accurate alignment is assured. This method is applicable for many parts with construction holes.



Two holes in the top of the part held in this fixture are line reamed accurately with respect to the radial hole which is not drilled to close tolerances

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.



Roughing and Finishing Operations Combined

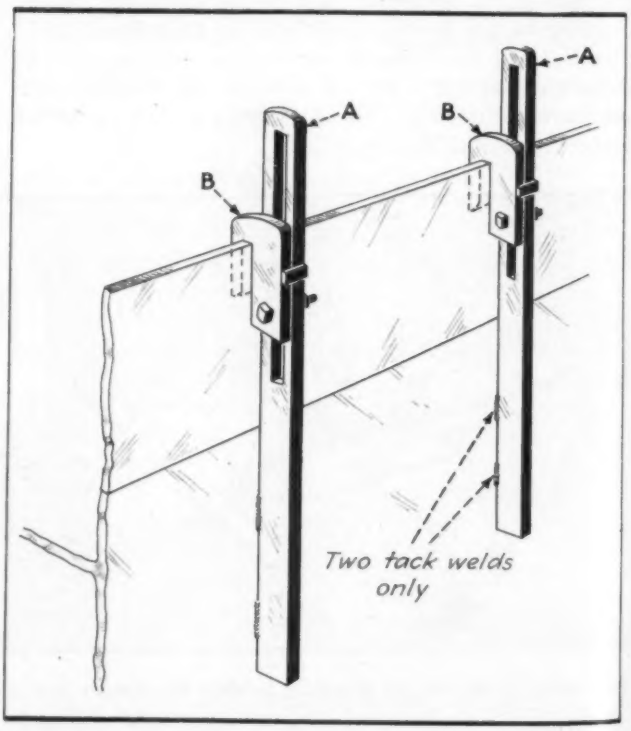
The turning and forming operations on the marine-engine gear extension shown in the drawing are performed on Lodge & Shipley lathes. The three tools held in the front toolpost turn diameters *A* and *B* simultaneously; since, surface *B* is considerably longer than surface *A*, two tools are used to cut this portion in the same amount of longitudinal carriage travel required to cut *A*. The five form tools held in the rear toolpost cut the radius and face the end of the shaft at *C*, cut radius *D*, form an undercut and face the shoulder at *E*, and form a radius and chamfer at *F*.

Each gear extension was first chucked in one lathe for roughing, and then in a second lathe for finishing. Inasmuch as but 1/32 in. of stock was removed in the roughing operation on the faces and radii, the operations on the first lathe were eliminated, thus combining both roughing and finishing operations into one job on the second machine. However, it is necessary to continue to take two cuts on surface *A* and *B* because of the larger amount of stock to be removed.

Since combining the operations, finish is equally good and production has increased from 12 to 20 pieces per shift. It eliminated a bottleneck, which made it possible to meet production requirements without adding more machines. *Suggested by John Wolfe, Marine Engine Division, Packard Motor Car Company.*

Setting of Ship Bulwarks Cut From 72 to 6 Hours

Previously it was the practice in mounting the bulwark sheets, which are upward extensions of the shell plating above the upper deck on C-2 cargo ships, to use small dogs along the outer and inner surfaces of the shell plate



for landing the bulwark sheet and strongbacks. These strongbacks were then tack welded to the sheet and shell for maintaining the sheet in proper planar alignment with the shell. In addition to these dogs and strongbacks, inclined stay bars were tacked to the bulwark sheet and deck.

The illustrated jig *A* combines the functions of the dogs, strongbacks and stay bars all in one unit, and is attached to the outer shell surface by two small tack welds. Sliding clamp *B* is then driven down to straddle the upper edge of the bulwark sheet so as to hold it in place and to straighten it vertically. The reduction in the number of tacks required over the old method has released tackers for other duties, has reduced chipping time, and has speeded up the work of painters who previously had been retarded by the welders and chippers.

In all, the device saves about 60 hours of erection time on each hull. The setting of the bulwark plates formerly required 72 man-hours, that is, a six-man rigger crew on each of two shifts. At present, the same crew with 125 of these devices can land and set the bulwark sheets in six hours. *Suggested by S. L. Daniels and G. S. Williams, Permanente Metals Corporation.*

Jig Makes Combination Pipe Bends

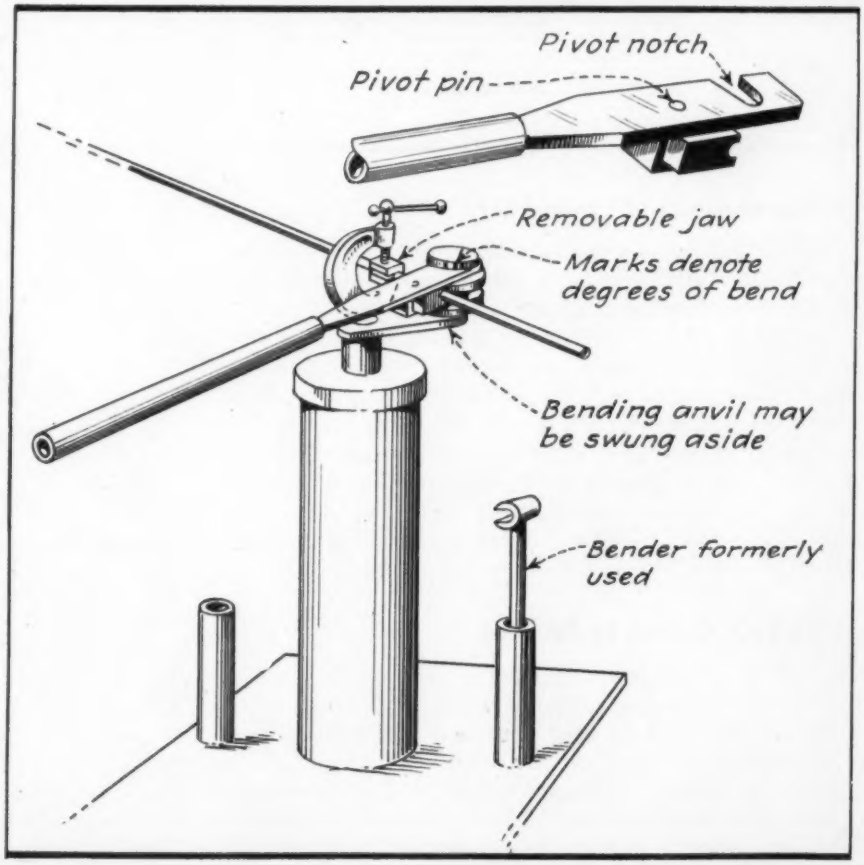
Bending and fitting of the eight gage line used on C-2 cargo ships was formerly done in the engine room on the ship by a pipefitter using a simple pipe bender. The bending of one 20 ft. length of pipe required four hours, and the bends were flattened and full of nicks and scratches. These conditions have been eliminated by the illustrated hand-operated bending jig.

The jig is comprised of a circular bending anvil with a peripheral groove sized to fit half of the pipe section. A block with a mating groove for the one in the bending anvil is fitted to a lever that pivots about a pin pressed in the anvil. Bends up to 180 deg. can be made. The jig is used in conjunction with a templet made of heavy wire which is bent on the ship to the desired shape and then brought to the pipe shop where the pipe is bent in the jig to duplicate the templet.

Besides producing superior gage lines, the jig turns out four times as many lines as before, which effects a saving of at least 24 man-hours construction time on each hull. The jig bends the pipe cold, does not flatten or scratch it, and produces any combination of close-up bends. These advantageous features of the pipe bending jig resulted in several of them being made for the yard.—*Suggested by Harry H. Carney, Permanente Metals Corporation.*

Simple Tool Removes Natco Drill-Head Bushings

The illustrated tool is used for pulling bushings from the heads of Natco multiple drills without removing the heads. The key is turned into the slot in the bolt which



is then inserted into the bushing. When the wire is pulled, the key assumes a position perpendicular to the axis of the bolt, after which the bolt is lowered and seated on top of the bushing. After a pipe spacer has been slipped over the bolt, the nut can be applied and tightened to remove the bushing. This tool has reduced the time necessary to remove the bushing by 50 percent. *Suggested by Robert Eckhart, Caterpillar Tractor Company.*

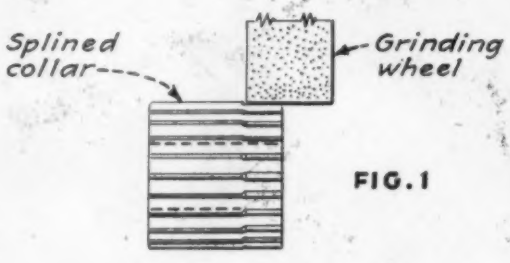


FIG. 1

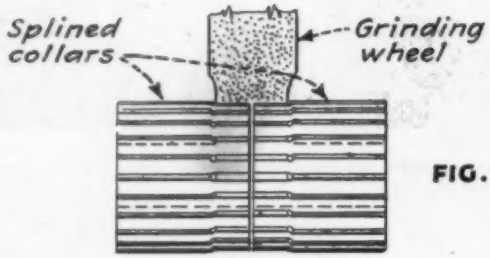


FIG. 2

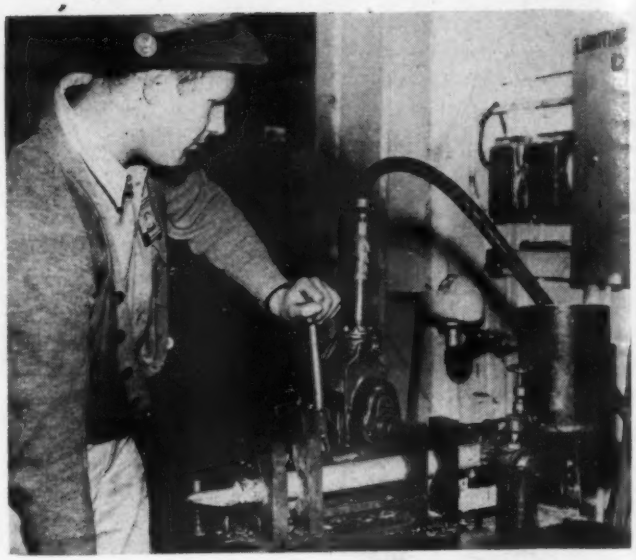
Increases Utility of Center-Type Grinder

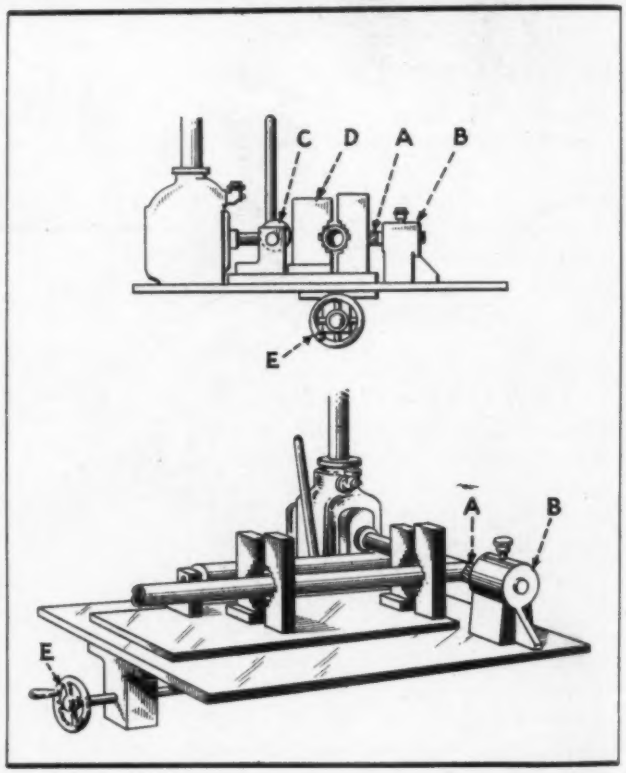
The small diameter on the splined collars shown in the drawing are ground to close tolerances. Previously, the collars were mounted on a short arbor and ground singly as shown in Fig. 1. A longer arbor was adapted to hold two collars, as shown in Fig. 2, and the corners of the grinding wheel were recessed to bring the face width equal to twice the width of the small diameter on the collar. Thus, two collars are ground at each loading of the arbor.

Based on a production schedule of 14,000 collars monthly, the practice described has effected an annual saving of 3,425 machine-hours. *Suggested by Phillip Trembot, Foote Brothers Gear and Machine Corporation.*

Pipe Ends Saddled by Reaming

The illustrated device for cutting pipe saddles employs an ordinary air drill to rotate shell reamer *A* at high speed. The free end of the reamer is supported in bearing block *B*. Eccentric clamp *C* closes movable vise jaws *D* on the pipe to be saddled. The plate on which the vise is mounted is movable on the supporting table through handwheel *E* and worm gears, thus making it possible to advance the



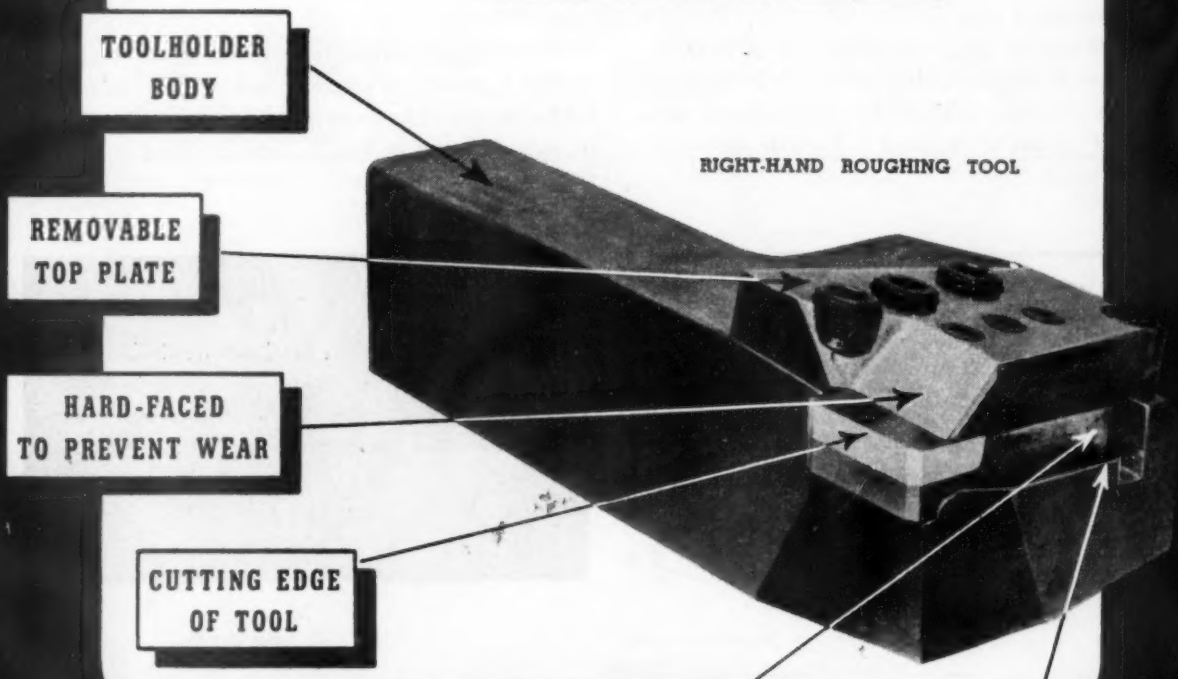


pipe quickly into the reamer for cutting and forming the saddle. This device has increased production 900 percent over the previous practice of flame-cutting the saddles. It is practical to replace the air motor with an electric motor.

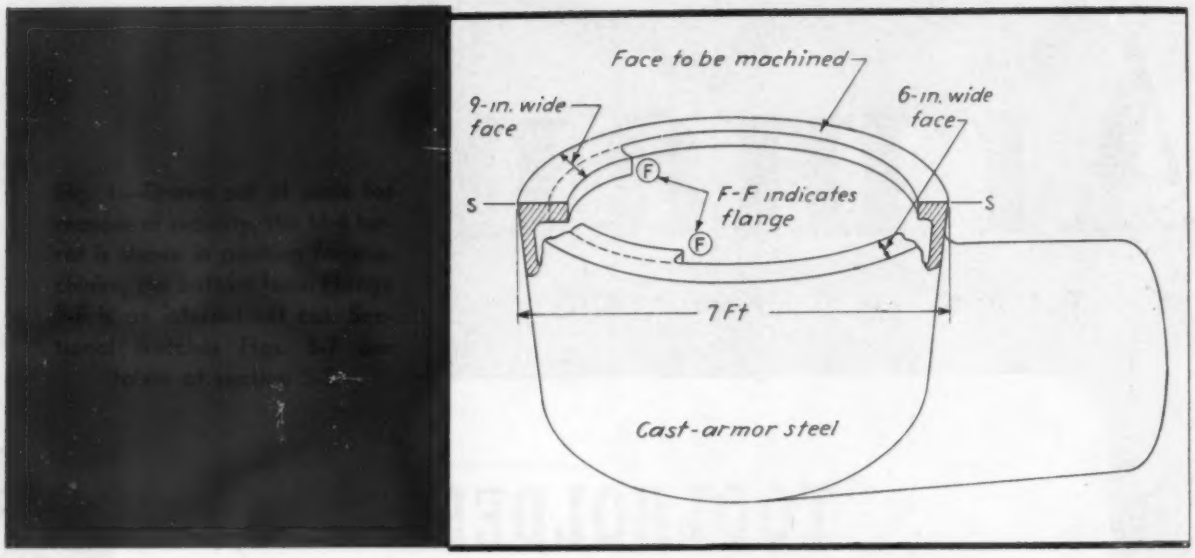
The production schedule calls for 700 pipe saddles to be cut during each eight-hour shift. This device saddles each pipe in 29 sec., compared to 5 min. when they were flame cut. Thus there is a saving of 50 man-hours each shift, or 150 hours per day. *Suggested by P. E. Ellison, Marinship Corporation.*

TOOLHOLDERS For Turret Machining

By the use of toolholders that incorporate necessary cutting angles, combat vehicle manufacturers are able to employ standard toolbits for heavy machining operations, with resultant economies in procurement, cost and grinding


TOOLHOLDER BODY
REMOVABLE TOP PLATE
HARD-FACED TO PREVENT WEAR
CUTTING EDGE OF TOOL
STELLITE WELDED-TIP TOOLBIT 1½ IN. WIDE, 4 IN. LONG
LEDGE TO PREVENT ROTATION OF TOOL

RIGHT-HAND ROUGHING TOOL



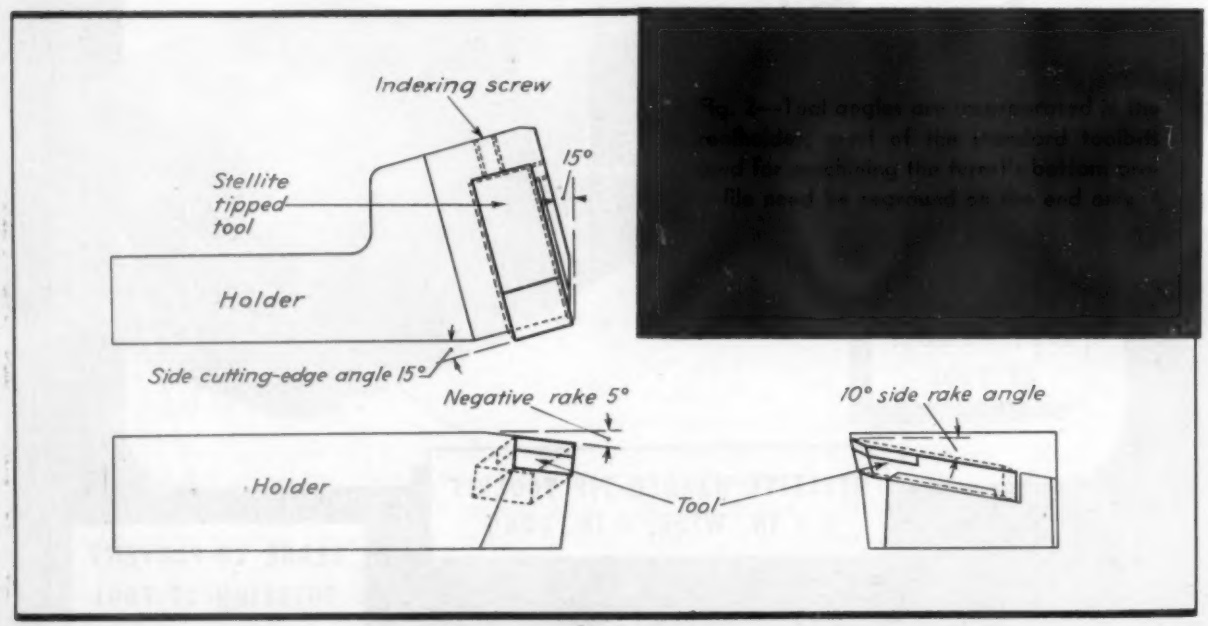
Toolholders for Turret Machining

ROUGH AND FINISH MACHINING of 6-ton turrets for M-4 tanks has been speeded, at low tool cost, by development of a toolholder for Stellite tools. The principal machining operation in which this holder now plays a part is in making the bottom profile of the turret; that is, the area that cradles the turret on its supporting ring bearing. This is also the section of the turret that provides a baffle for the bearing surfaces in the finished tank.

The M-4 turrets, which are about 7-ft. in diameter and have a 6-in. bottom width, are machined on Betts 112-in. boring mills. This 40-hp. mill is fitted with two heads that can be operated at variable speeds, together or singly.

Tool problems are complicated by several factors: a variable hardness in the armor steel casting, especially near the edge when flamecut; chatter resulting from walls that are comparatively thin in proportion to the approximately 7-ft. over-all diameter; and a complicated intermittent facing cut. These conditions, if met by using large tools, would result in a relatively high original tool cost and excessive tool-grinding time.

Three types of toolholders were designed by Haynes Stellite engineers to accommodate smaller tools. The holder for the right-hand roughing operation is shown on page 113 and in Fig. 2. The left-hand holder for the roughing operations is a mirror image of this.



As the illustrations show, the toolholder incorporates most of the necessary cutting and clearance angles normally ground into the tools, and it is designed to hold tools of relatively small cross-sections. Both features facilitate tool-grinding operations, for most of the toolbits employed need to be reground on the end only; and, because the bits are relatively small, grinding is more rapid. In fact, because of this simplification, the tools used on the turret job can now be machine-ground at the rate of 50 an hour on an oscillating-type grinder using a ring wheel.

Cuts Made by Coordinating Two Heads

As can be seen in Fig. 3 the depth of metal to be removed from the turret bottom varies from ⅜ in. to more than 1 in., depending upon the amount of metal left after casting gates are removed by oxyacetylene flame-cutting. The roughing cuts are accomplished in a series of timed operations by coordinating tools in both the left- and right-hand heads. These cuts remove all the metal on the bottom face of the turret down to the location line *A-A* shown in Fig. 3.

Fig. 1 illustrates that the bottom face of the casting, while 6 in. wide for most of the circumference, has one section where an inner flange runs about 50 in. around the inside circumference. There the face is approximately 9 in. wide. In the first roughing operation, the left-hand tool, which feeds from the inside outward (right to left in Fig. 4), removes the metal from the 3-in. width of this flange in a heavy intermittent cut.

At the same time, the right-hand tool feeds in from the outside diameter (right to left in Fig. 4) for a total distance of 6 in., removing all the metal down to the location line on the 6-in. face.

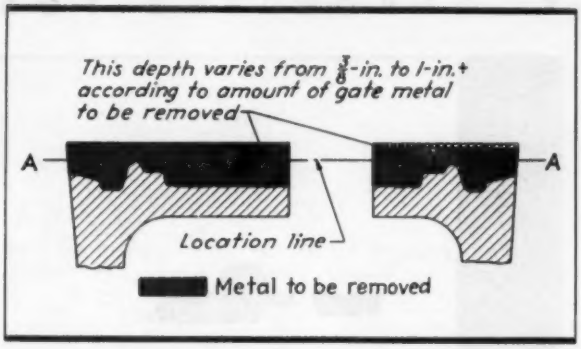


Fig. 3—An approximate cross-section of the bottom face of the turret shows the amount of metal that must be removed from the casting to attain the desired profile

The second step in the roughing operation begins when the right-hand tool has half-completed its cut. At this point, the left-hand tool has finished its cut on the flange and is run back out, dropped down, and —taking a depth of cut of about 15/16 in.—feeds outward (right to left to *C* in Fig. 5) for a distance of approximately 4¾ in. The first 3 in. of this second cut made by the left-hand tool are intermittent, as before, while the remaining 1¾ in. are continuous cutting. Meanwhile, by the time the left-hand tool has been dropped down and has fed for a second time across the 3-in. intermittent cut, the right-hand tool has completed the removal of all the metal down to the location line on the 6-in. wide face so that the

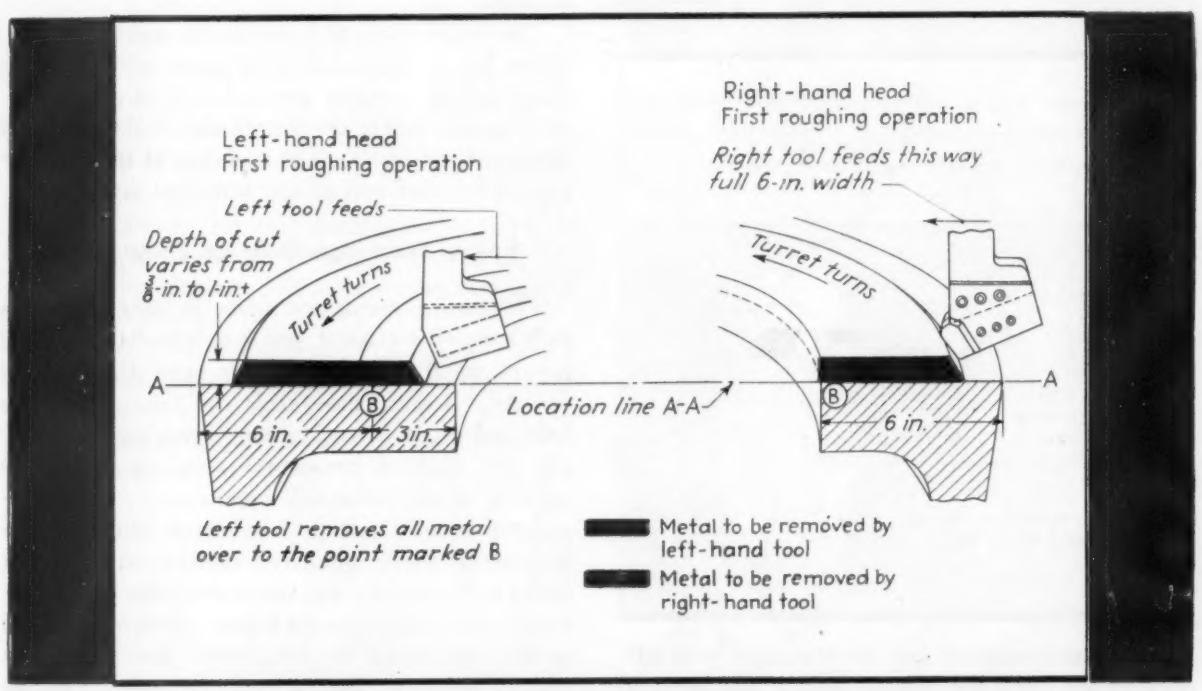


Fig. 4—Initial roughing cuts are taken simultaneously by the right- and left-hand heads

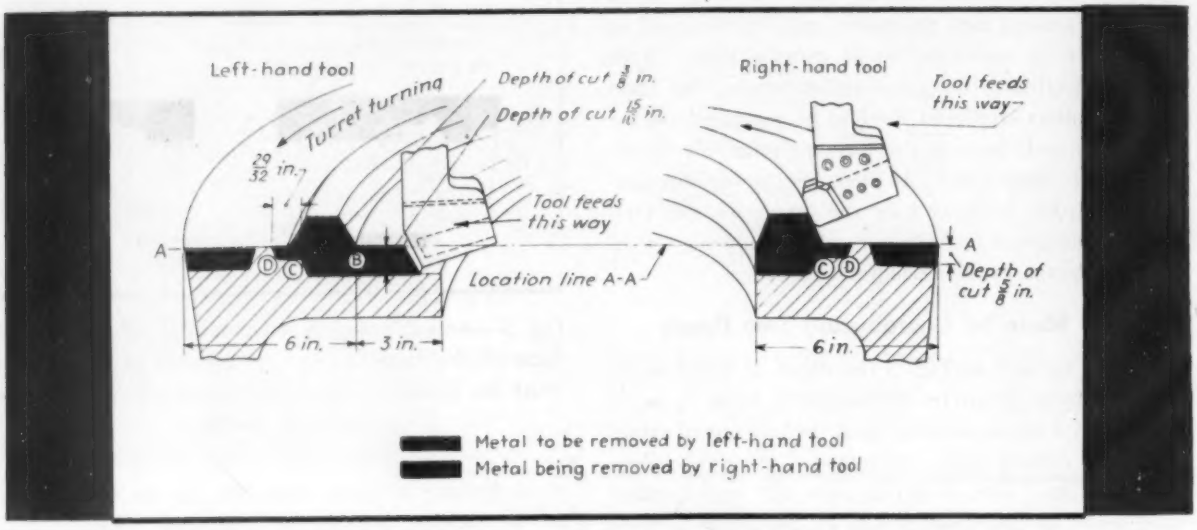


Fig. 5—After half the metal above location line A-A has been removed, the left-hand tool is dropped to take a second intermittent cut on the flange. The last 1¾ in. of this cut is continuous

left-hand tool, now operating at a lower level, can continue its travel without interruption.

When the left-hand head has completed its 4¾-in. travel at the 15/16-in. depth of cut, it is raised to take a cut only ⅜ in. deep, for a continued travel of 29/32 in., or to *D* in Fig. 5.

When the right-hand head has completed its full 6 in. of travel on the first roughing cut, it is run back out, dropped down to take its second rough cut of ⅝ in. depth, and then feeds in (right to left in Fig. 6) for a distance of 2½ in. This completes its final roughing cut. By following the steps outlined, both heads complete the rough cutting at approximately the same time. The contour of the turret bottom after completion of this sequence of roughing operations is also shown in Fig. 6.

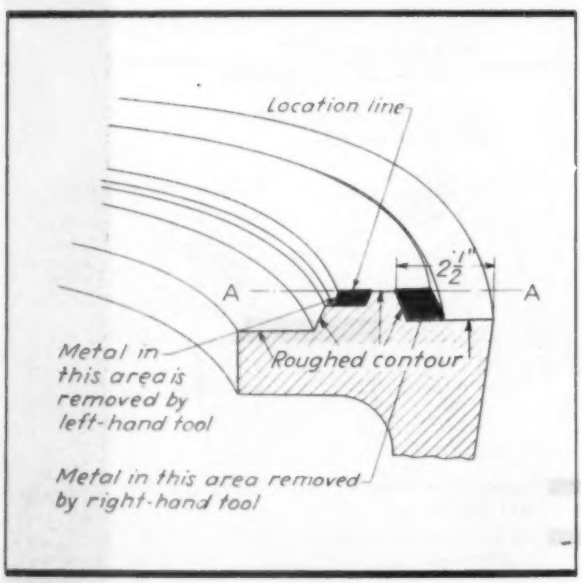


Fig. 6—Final roughing cuts by the right- and left-hand heads bring the bottom face of the turret to the desired profile

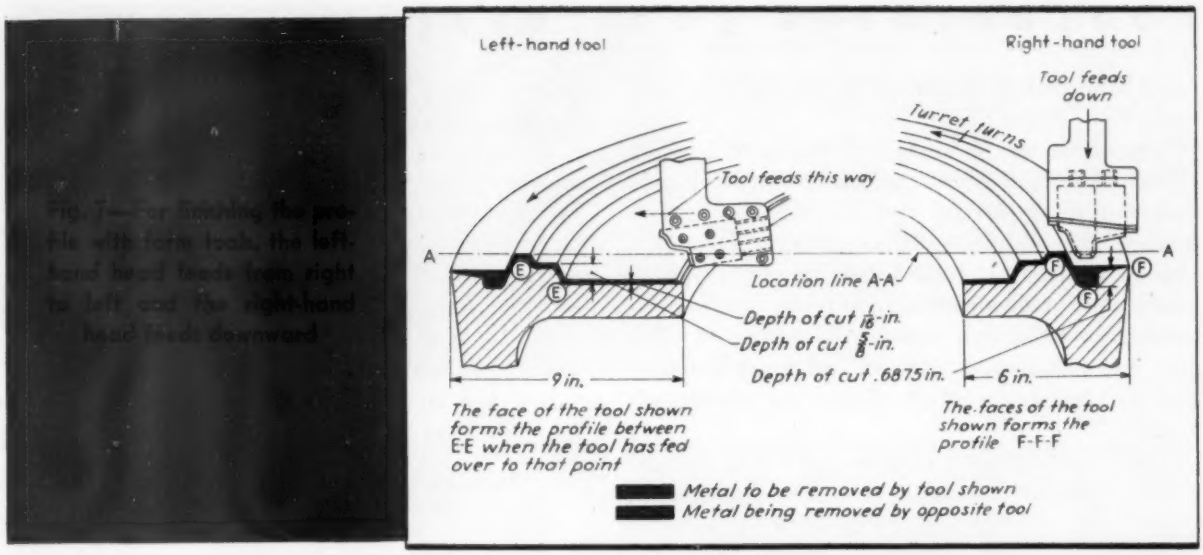
Form tools are used for both finishing operations. On the left-hand head, a double form tool arrangement is fed outward (right to left in Fig. 7) taking a depth of cut of 1/16 in. for a total travel of 4¾ in., the first 3 in. of which are intermittent cutting, the last 1¼ in. being continuous. Setscrews backing up the two parts of the form tool provide means for setting the two tools with relation to each other so that the entire form is finished simultaneously and accurately.

The double form tool used in the right-hand toolholder for finishing, instead of being fed sidewise, is plunged—fed straight down 11/16 in.—to finish-machine the profile on the outside of the machined surface of the turret. The chamfers of this ring are ground into one tool of this form-tool set-up.

Heavy Feed Specified for Form Tools

The cutting speeds and feeds on these operations vary from 40 surface ft. per min. with 0.060-in. feed per rev. to 60 surface ft. per min. with 0.040-in. feed per rev. Because these tools can take such heavy feeds and depths of cut, caution is necessary to assure that the required horsepower does not exceed the capacity of the boring-mill motor.

A number of the features of the operation, particularly the roughing cuts, are somewhat unusual. For example, the cutting and clearance angles of the left-hand tool are built into the holder. They are adjusted so that the face of the tool, rather than an edge or corner, absorbs the impact of the intermittent flange-cut. A side-rake angle of 10 deg. (Fig. 8), and the



negative rake of 5 deg. are responsible for this feature which minimizes tool damage.

The right-hand roughing tools operate with the same side rake and negative rake angles. The side cutting angles of these bits, their lead angles, are each 15 deg., which makes possible safe starting of the tool in the cut and also leaves a 15 deg. angle at the end of the cut, thus reducing the amount of metal left to be removed by the form or finishing tool.

Since both right and left-hand holders use roughing tools that are ground exactly the same, grinding work is simplified and a lower toolbit inventory is possible.

Additional ideas incorporated in the toolholders can be observed by comparison of the two sketches in Fig. 9. Referring to the left-hand head, when the roughing tool is in use, only that section of the cutting edge between points *B* and *C* is actually cutting; the section *A* to *B* is riding free. When the section *B* to *C* is worn, or if the point *C* is chipped, the tool can be tranferred to the right-hand holder where it is turned over to present the unused section, *A* to *B*, as the only operating cutting edge.

To compensate for tool stock removed from the bits during grinding, ½ in. setscrews index the bits the necessary amount. These setscrews also act as back-up screws.

Form Tools Use Standard Toolbits

Instead of using full-face form tools for the finishing operations, the finishing toolholders are also designed to use standard square toolbits in conjunction with small brazed-tip form tools ground to special profiles. How this is accomplished is illustrated in Fig. 10. Tool No. 1 in the left-hand head is a ¾-in. standard square bit, 3-in. long and ground with square ends. Tool No. 2 in this set-up is a similar bit with the end ground to the proper profile. The same principle is applied to tools Nos. 3 and 4 in the right-

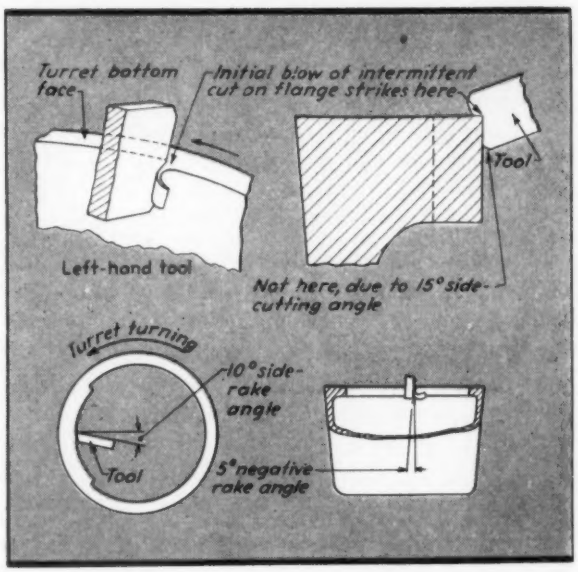


Fig. 8—By incorporating the proper angles in the holder, the tool bit is presented to the work in a manner calculated to minimize breakage

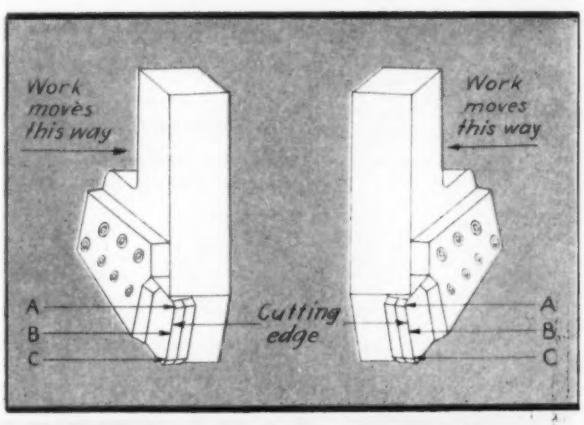


Fig. 9—Roughing tools worn in one holder can be transferred to the other holder and will then present a new cutting edge to the work

hand head, both of which are rectangular brazed-tip tools.

The advantages of using two bits instead of one in each holder are obvious; all toolbits are stock items instead of being specially cast, and they have the advantages of simplified grinding, lower tool cost and assured availability. In addition, complicated profile angles and radii—particularly inside radii—make solid form tools more difficult to grind, yet when split into two or more parts as here, the grinding of each part becomes relatively simpler and considerably faster.

Furthermore, because of these "split-tool" arrangements, much less tool metal is wasted. This is true because, on form tools in general and particularly so on this job, one part of the tool's cutting edge wears considerably faster than the other parts. As a result, when a solid form tool needs to be reground because a small area is worn, other areas that are still good must also be removed, wasting valuable metal. In the split arrangement, only the worn half of the split tool needs to be reground.

Hard-Faced Chip Breaker

The heavy cuts produce heavy chips. To take care of them, the chip face of the toolholder is protected from wear by a welded-on deposit of Stellite hard-facing alloy. This face is so designed that chips curl into a circle less than 2 in. in diameter. They are directed upward and over the shoulder of the cut. In spite of their thickness and toughness, directing them this way causes them to break in one turn. These features of the chip face have practically eliminated the chip problem.

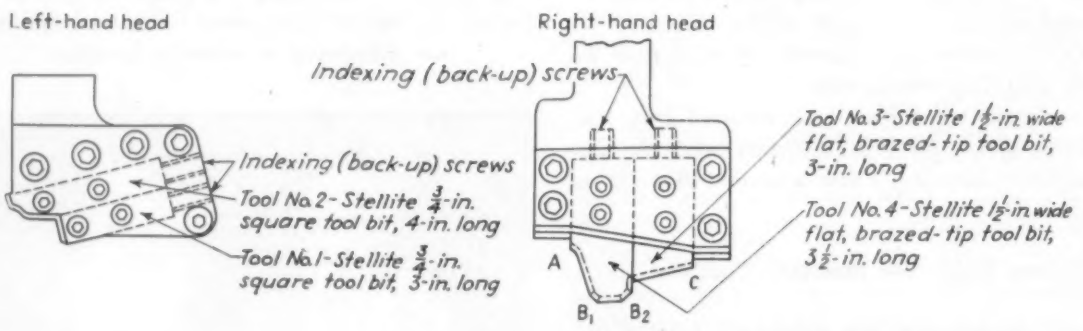
From the sequence of operations, it can be seen that six tool bits—two roughing and four finishing—are necessary to rough- and finish-machine the bottom face of the turret. Tool changes on the roughing operations vary from two to six per turret. A conservative figure on the life of the roughing tools is 1 to 1½ tools used completely per turret machined. Form tools for finishing must be reground after each turret, and an average of about twelve turrets can be finished per tool.

Standardization Reduced Tool Costs

Tool costs naturally vary from turret to turret. In one plant the first run of 25 turrets—using Stellite tools—showed a total tool cost of $14.88 per turret, a figure obtained from all the factors including original tool cost, regrinding, and time for tool changes. As these machining procedures have been developed further, however, it has been established that tool costs of less than half of this figure can be expected.

The time varies considerably from turret to turret, because of variations encountered. A conservative average figure, however, is about 3½ to 5½ hours per turret.

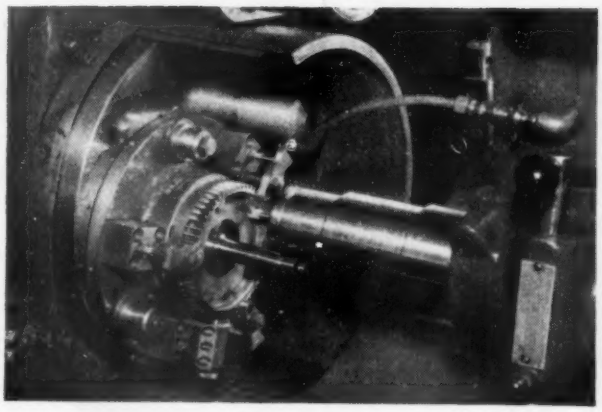
The use of Stellite tools and toolholders similar to those described is not limited to the machining of tank turrets. In fact, the use of this type of toolholder can now be considered for almost any heavy production job that warrants its fabrication, especially because of savings in tool material.

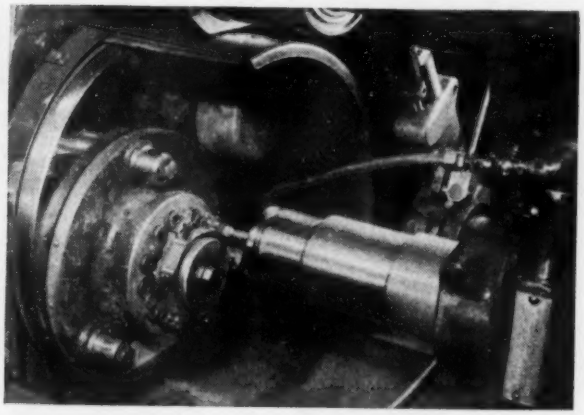

Left-hand head
Right-hand head
Indexing (back-up) screws
Indexing (back-up) screws
Tool No. 2 - Stellite ¾-in. square tool bit, 4-in. long
Tool No. 1 - Stellite ¾-in. square tool bit, 3-in. long
Tool No. 3 - Stellite 1½-in. wide flat, brazed-tip tool bit, 3-in. long
Tool No. 4 - Stellite 1½-in. wide flat, brazed-tip tool bit, 3½-in. long
A
B1
B2
C

Note: The form tool face A-B_1-B_2 wears much faster than the face B-C. Since the tool is split; only the half with the worn face requires regrinding

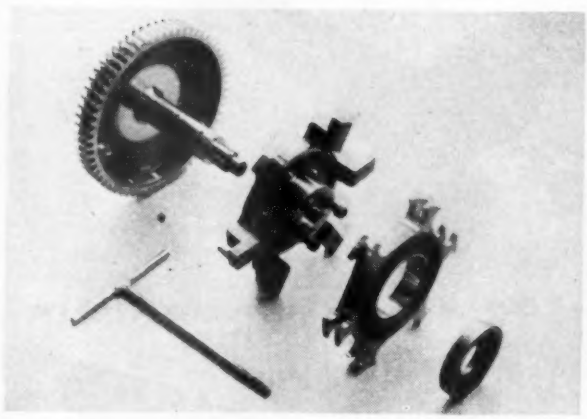
New Ways By Chevrolet

As producer of America's No. 1 car, Chevrolet Division of General Motors had personnel who knew all the tricks of turning out mass-produced parts quickly, cheaply, efficiently. Those skills have gone to war as countless examples testify in connection with manufacture of Pratt & Whitney aircraft engines, artillery, military trucks. Selected cases, complete as to "before" and "after" data, indicate how high-powered attention to detail brings assemblies off the line on schedule.

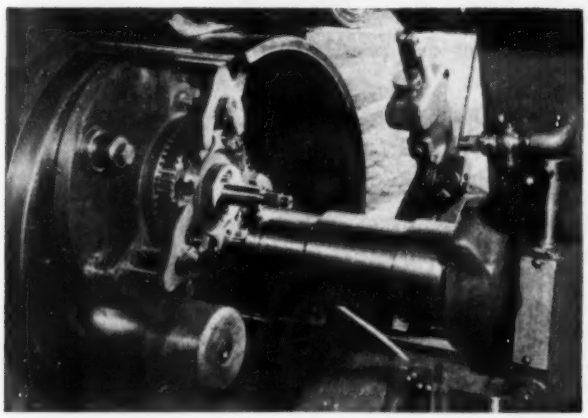




Formerly the two components were ground separately in a total time of 140 min.



A special clamp aligns the two parts



They are now ground together in 77 min.

GRINDING SPRING POCKETS

Old Way

Spring pockets in two related Pratt & Whitney engine parts—the intermediate drive gear and the fixed spring blower drive—were formerly ground separately in 70 min. each, or 140 min. for the set.

New Way

Chevrolet tool engineers redesigned the chucking fixture, and by using a specially designed alignment clamp, now grind both parts in one operation. The time per set is 77 min.

Results

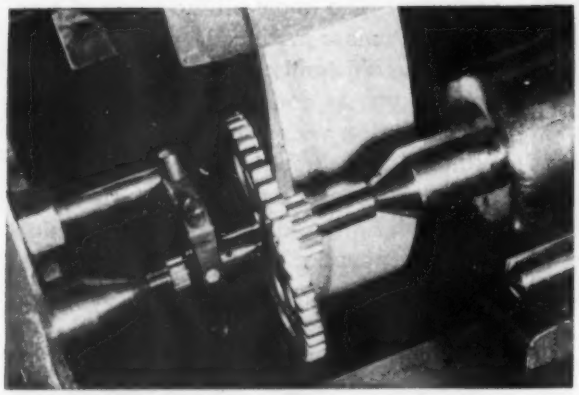
Labor saving per set.....45 percent

Capital investment saving.....$188,418

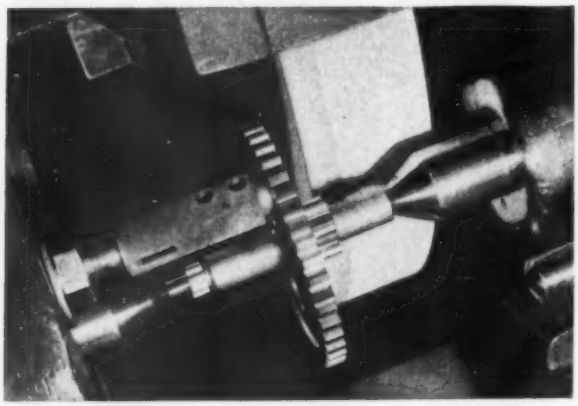
(Purchase orders for 18 additional machines were canceled)

Manpower saved.....18 operators, one set-up man

Floor space saved.....2,600 sq.ft.



Conventional but time-consuming work driver



This one is engaged in a moment

GRINDING CAM REDUCTION DRIVE GEAR

Old Way

To grind the faces of the large gear in this Pratt & Whitney component, the following sequence was used: (1) assemble driving dog and gear, (2) load machine, (3) grind first face, (4) remove driver, (5) replace driver on opposite end of gear, (6) reload machine, (7) grind second face of gear. Production amounted to 96 gears per day.

New Way

Chevrolet developed a telescoping driver that engages a hole in the web of the gear, is permanently mounted on the faceplate and avoids the need for assembling and removing the driver twice, as formerly done. The sequence of operations now is: (1) place gear in machine, (2) grind first face—short position of gear, (3) index part on machine, and (4) grind second face—or long position of gear.

Results

This simple change in work-driving means boosted production to 288 gears per day, or an increase of 200 percent, which shows that attention to small details pays big dividends.

MASTER CONNECTING ROD FORGING

Old Way

The procedure established by the prime contractor required that test bars be forged with each rod. The forging required 51 lb. of chrome-nickel-molybdenum steel.

New Way

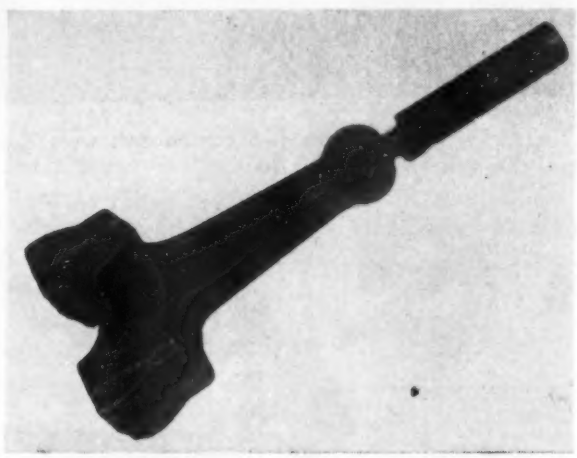
Dies were designed by Chevrolet to eliminate the test bar. The tong hold is now used for the test bar. Furthermore, only one bar need now be tested for each ten rods. Each forging consumes 48½ lb. of steel.

Results

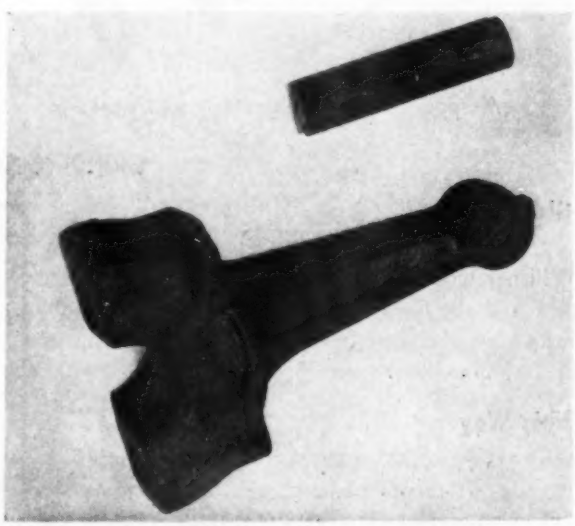
Steel saved per rod....2½ lb.

Elimination of press drawing tong hold saved.... one man per shift.

Savings in laboratory test-bar machining and testing....90 percent.



Each rod originally had an integral test bar



Now the tong hold is used for a test bar

Three-Wire Measurement of Screw Threads—III

BY JOSEPH F. HEATON

THE TOLERANCES established for the four classes of fit are cumulative and include all variations of lead and angle. The full tolerance on pitch diameter cannot be used unless the lead and angle of the screw thread are perfect—a rare condition—although blueprint specifications frequently specify the full tolerance, as given in the tables under measurements over wires.

Error in lead and angle is unavoidable, and hence part of the tolerance should be reserved to compensate for them. In practice, excellent results have been obtained on screw products by working to a figure halfway between the maximum and minimum measurements over wires, as tabulated.

Use of best wires for pitch diameter measurements is desirable, but the following formula can be applied if other than best wires are employed: Measurement over wires equals three times substitute wire size minus best wire constant plus the pitch diameter.

Example:

To find the maximum measurement over wires for a ½"—NF-2 thread when the nearest wire to the best wire size measures 0.03000 in.

$M = 3 \times 0.03000 - 0.04330 + 0.46752 = 0.51422$

For a Class 2 fit, the difference between the maximum and minimum measurements over the wires for a ½"—NF-2 thread is 0.0036 in., but 0.004 in. can be used as an approximation of the full tolerance. By working to the half-way figure in order to compensate for the probability of lead and angle errors, the minimum measurement over wires becomes 0.51422—0.002, equals 0.51222 in. Obviously the maximum measurement over wires should not be less than 0.51422 in.

To find the pitch diameter:

Working figure over wires	0.51222
Plus best wire constant	0.04330
	0.55552
Less 3 times wire used	0.09000
Actual pitch diameter	0.46552

If a periodic check with a pitch-diameter micrometer gage gives readings that are equivalent with those obtained by three-wire measurement, the measuring procedure is correct, and it may be assumed that lead and angle errors are not serious.

Class 1, Loose Fit, American National Fine-Thread Series

Size	Threads Per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Max.	Measurement Over Wires Min.
0	80	.01250	0.05930	.00812	0.05118	.01083	.00722	0.06201	0.05961
1	72	.01389	0.07230	.00902	0.06328	.01203	.00802	0.07531	0.07281
2	64	.01563	0.08530	.01015	0.07515	.01353	.00902	0.08868	0.08608
3	56	.01786	0.09820	.01160	0.08660	.01546	.01031	0.10206	0.09926
4	48	.02083	0.11110	.01353	0.09757	.01804	.01203	0.11561	0.11251
5	44	.02273	0.12410	.01476	0.10934	.01968	.01312	0.12902	0.12582
6	40	.02500	0.13700	.01624	0.12076	.02165	.01443	0.14241	0.13901
8	36	.02778	0.16290	.01804	0.14486	.02406	.01604	0.16892	0.16532
10	32	.03125	0.18890	.02030	0.16860	.02706	.01804	0.19566	0.19186
12	28	.03571	0.21480	.02320	0.19160	.03093	.02062	0.22253	0.21823
¼	28	.03571	0.24880	.02320	0.22560	.03093	.02062	0.25653	0.25223
5/16	24	.04167	0.31120	.02706	0.28414	.03608	.02406	0.32022	0.31562
3/8	24	.04167	0.37370	.02706	0.34664	.03608	.02406	0.38272	0.37812
7/16	20	.05000	0.43600	.03248	0.40352	.04330	.02887	0.44682	0.44172
½	20	.05000	0.49850	.03248	0.46602	.04330	.02887	0.50932	0.50422
9/16	18	.05556	0.56090	.03608	0.52482	.04811	.03207	0.57293	0.56723
5/8	18	.05556	0.62340	.03608	0.58732	.04811	.03207	0.63543	0.62973
¾	16	.06250	0.74820	.04060	0.70760	.05413	.03608	0.76173	0.75543
7/8	14	.07143	0.87290	.04640	0.82650	.06186	.04124	0.88836	0.88136
1	14	.07143	0.99790	.04640	0.95150	.06186	.04124	1.01336	1.00636
1⅛	12	.08333	1.12260	.05413	1.06847	.07217	.04811	1.14064	1.13274
1¼	12	.08333	1.24760	.05413	1.19347	.07217	.04811	1.26564	1.25774
1⅜	12	.08333	1.37260	.05413	1.31847	.07217	.04811	1.39064	1.38274
1½	12	.08333	1.49760	.05413	1.44347	.07217	.04811	1.51564	1.50774

STOP—
SCRAPPING WORN GAGE BLOCKS!

They're worth money to you . . .

Are you throwing out worn gage blocks? If you are —stop it now and turn them in to Webber Gage Co. You can salvage your old gage blocks—Webber will allow you 10% on all replacement blocks in exchange for your worn or damaged blocks.

Here's a saving in the cost of blocks and one that will pay dividends in maintaining dependable accuracy of production.

The accuracy of Webber Gage Blocks is recognized by a host of manufacturers now using Webber Gage Blocks in all phases of manufacture from the laboratory to the production line.

Remember—Webber is the largest exclusive manufacturer of Gage Blocks. Webber Gage Blocks are produced with the most modern equipment—under ideal conditions—by men experienced in the craft.

Webber also provides attractive delivery on both A and B accuracy gage blocks.

Set No. 84 contains 84 blocks in sizes from .050″ to 4.000″. Range .100″ to 12.000″ in steps of .001″, .200″ to 12.000″ in steps of .0001″.

Price Set No. 84A — $350.00
Set No. 84B — $235.00

Set No. 43 contains 43 blocks in sizes from .100″ to 4.000″— ideal for tool rooms and small shops. Range .200″ to 10.000″ in steps of .001″, .300″ to 10.000″ in steps of .0001″.

Price Set No. 43A — $185.00
Set No. 43B — $150.00

All "A" accuracy sets are accurate within .000004″ —all "B" accuracy sets within .000008″.

Set No. 38 (Thin Blocks) is supplementary to Set No. 84. Range .100″ to 4.000″ in steps of .001″ .150″ to 4.000″ in steps of .00005″.

Price Set No. 38A — $195.00
Set No. 38B — $155.00

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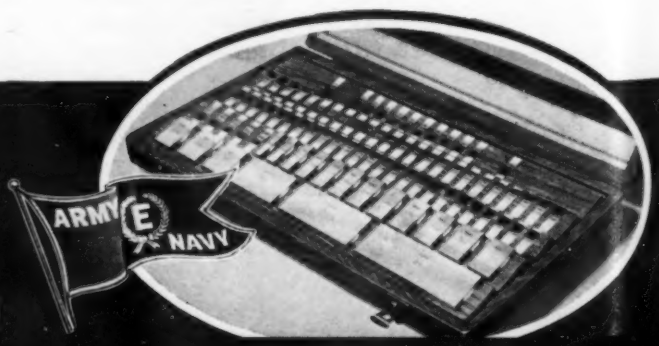

Three-Wire Measurement of Screw Threads—IV

Class 2, Free Fit, and Class 3, Medium Fit

American National Fine Thread Series

Size	Threads per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Classes 2-3 Max.	Measurement Over Wires Class 2 Min.	Measurement Over Wires Class 3 Min.
0	80	.01250	0.06000	.00812	0.05188	.01083	.00722	0.06271	0.06101	0.06141
1	72	.01389	0.07300	.00902	0.06398	.01203	.00802	0.07601	0.07421	0.07471
2	64	.01563	0.08600	.01015	0.07585	.01353	.00902	0.08938	0.08748	0.08798
3	56	.01786	0.09900	.01160	0.08740	.01546	.01031	0.10286	0.10086	0.10136
4	48	.02083	0.11200	.01353	0.09847	.01804	.01203	0.11651	0.11431	0.11491
5	44	.02273	0.12500	.01476	0.11024	.01968	.01312	0.12992	0.12762	0.12832
6	40	.02500	0.13800	.01624	0.12176	.02165	.01443	0.14341	0.14101	0.14171
8	36	.02778	0.16400	.01804	0.14596	.02406	.01604	0.17002	0.16752	0.16822
10	32	.03125	0.19000	.02030	0.16970	.02706	.01804	0.19676	0.19406	0.19486
12	28	.03571	0.21600	.02320	0.19280	.03093	.02062	0.22373	0.22063	0.22153
1/4	28	.03571	0.25000	.02320	0.22680	.03093	.02062	0.25773	0.25463	0.25553
5/16	24	.04167	0.31250	.02706	0.28544	.03608	.02406	0.32152	0.31822	0.31912
3/8	24	.04167	0.37500	.02706	0.34794	.03608	.02406	0.38402	0.38072	0.38162
7/16	20	.05000	0.43750	.03248	0.40502	.04330	.02887	0.44832	0.44472	0.44572
1/2	20	.05000	0.50000	.03248	0.46752	.04330	.02887	0.51082	0.50722	0.50822
9/16	18	.05556	0.56250	.03608	0.52642	.04811	.03207	0.57453	0.57043	0.57153
5/8	18	.05556	0.62500	.03608	0.58892	.04811	.03207	0.63703	0.63293	0.63403
3/4	16	.06250	0.75000	.04060	0.70940	.05413	.03608	0.76353	0.75903	0.76033
7/8	14	.07143	0.87500	.04640	0.82860	.06186	.04124	0.89046	0.88556	0.88686
1	14	.07143	1.00000	.04640	0.95360	.06186	.04124	1.01546	1.01056	1.01186
1 1/8	12	.08333	1.12500	.05413	1.07087	.07217	.04811	1.14304	1.13744	1.13904
1 1/4	12	.08333	1.25000	.05413	1.19587	.07217	.04811	1.26804	1.26244	1.26404
1 3/8	12	.08333	1.37500	.05413	1.32087	.07217	.04811	1.39304	1.38744	1.38904
1 1/2	12	.08333	1.50000	.05413	1.44587	.07217	.04811	1.51804	1.51244	1.51404

Class 4, Close Fit, American National Fine-Thread Series

Size	Threads Per Inch	Pitch	Major Dia. Max.	Depth of Thread	Pitch Dia. Max.	Best Wire Constant	Best Wire Size	Measurement Over Wires Max.	Measurement Over Wires Min.
1/4	28	.03571	0.25000	.02320	0.22700	.03093	.02062	0.25793	0.25683
5/16	24	.04167	0.31250	.02706	0.28574	.03608	.02406	0.32182	0.32062
3/8	24	.04167	0.37500	.02706	0.34824	.03608	.02406	0.38432	0.38312
7/16	20	.05000	0.43750	.03248	0.40532	.04330	.02887	0.44862	0.44732
1/2	20	.05000	0.50000	.03248	0.46782	.04330	.02887	0.51112	0.50982
9/16	18	.05556	0.56250	.03608	0.52672	.04811	.03207	0.57483	0.57333
5/8	18	.05556	0.62500	.03608	0.58922	.04811	.03207	0.63733	0.63583
3/4	16	.06250	0.75000	.04060	0.70980	.05413	.03608	0.76393	0.76233
7/8	14	.07143	0.87500	.04640	0.82900	.06186	.04124	0.89086	0.88906
1	14	.07143	1.00000	.04640	0.95400	.06186	.04124	1.01586	1.01406
1 1/8	12	.08333	1.12500	.05413	1.07137	.07217	.04811	1.14354	1.14154
1 1/4	12	.08333	1.25000	.05413	1.19637	.07217	.04811	1.26854	1.26654
1 3/8	12	.08333	1.37500	.05413	1.32137	.07217	.04811	1.39354	1.39154
1 1/2	12	.08333	1.50000	.05413	1.44637	.07217	.04811	1.51854	1.51654

POLISHED FLUTES

These polished flutes are absolutely necessary in the successful drilling of holes of medium and great depths on a production basis, and in no small measure are responsible for the successful performance of Ampco drills on shallow holes and general work.

All types of drills above ½" are polished in the flutes and can be obtained either at the factory or at any of our numerous branches. And all sizes below ½" are burnished in the flutes.

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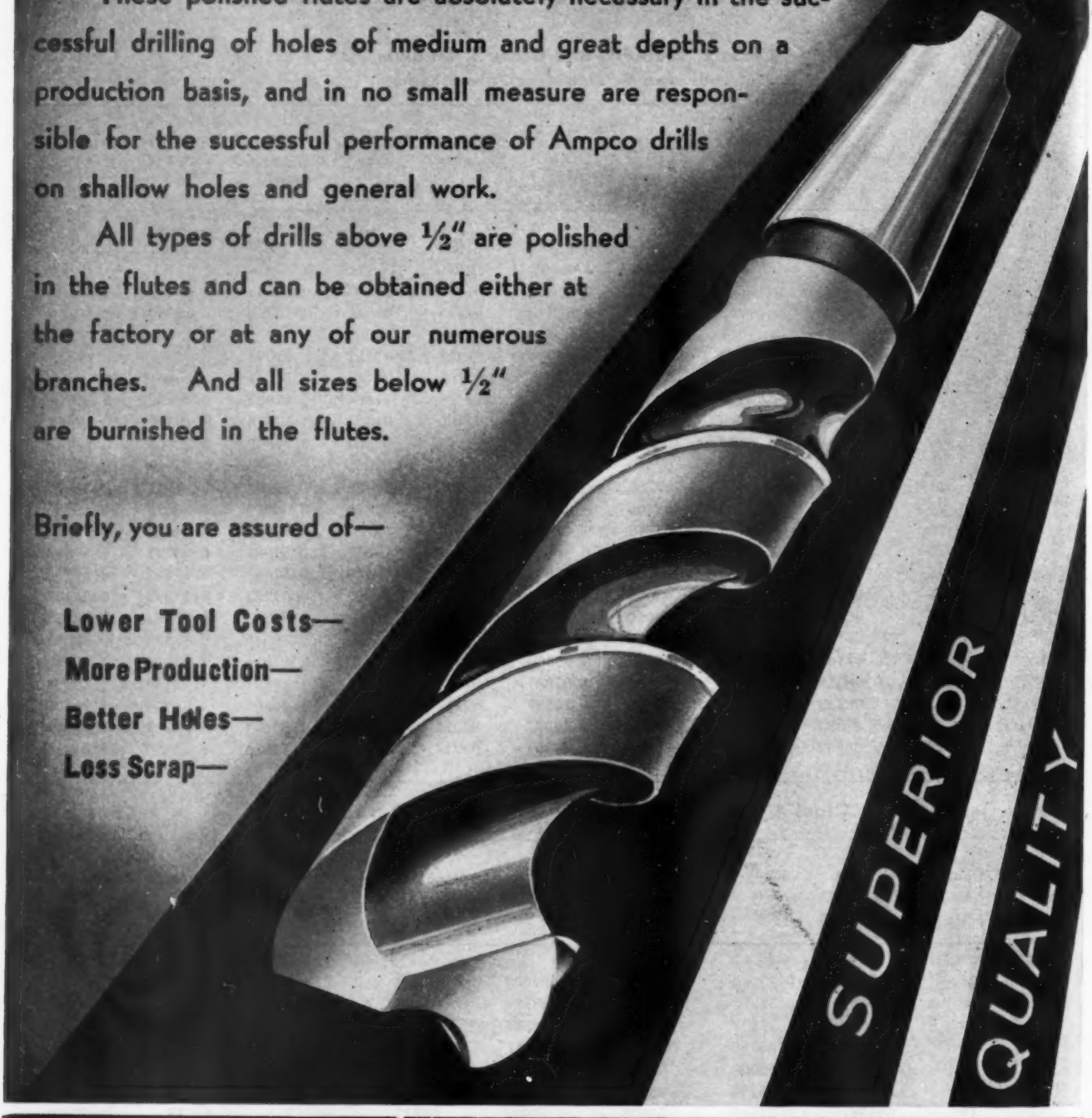
Lower Tool Costs—
More Production—
Better Holes—
Less Scrap—



AMPCO TWIST DRILL CO.

JACKSON, MICHIGAN U. S. A.

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Distributors in All Principal Cities

The Will To Do It

BEFORE WE INDULGE in too much talk about reaching the bottom of the manpower barrel, let's put more emphasis on utilizing more efficiently the labor already in our war industries.

Consider what certain changes in procedure would accomplish.

1. Abolish or modify restrictive inter-union and intra-union rules.

Ordinarily shipfitters are not permitted to do tack welding. In one yard short of welders, the management and the government have persuaded union officials to suspend regulations and allow shipfitters to do welding. The result is a sudden increase in production from 20,000 feet a day to 39,000, or almost double the previous rate.

Welding, one should add, is the worst bottleneck in shipbuilding. What has been done in one yard can be done elsewhere. And restrictive union policies are by no means confined to shipyards. They are in many war industries.

2. Eliminate "feather-bedding." Regardless of what may have been tolerated in peacetime, it is nothing short of criminal to let rules stand today that require two men to do a job that can be done by one man.

Such a profligate waste of manpower is inexcusable at a time when we must use carefully and well all of our human resources.

3. Encourage incentives rather than discourage them. Because union officials look with suspicion upon incentive plans, the government refuses to push them. Even if a few employers in years past took advantage of such plans, safeguards now can be set up to bar such abuses. And the war effort would gain impetus from the adoption of incentive systems.

Writes an experienced manufacturing executive, "I want through the ——— plant. It is doing a beautiful job of quality, but the employees are not really working. The vice president said that they could make a tremendous saving if permitted to use an incentive scheme, but they were given no encouragement on that score (by the union)."

That single instance can be duplicated a hundredfold.

Dozens of observers will testify that employees in many war plants are working in a free and easy sort of way. Some people would call it by the less polite term of plain loafing.

That situation is not easily corrected, but if management, union officials and the government put their hands to it on a cooperative basis, a substantial improvement can be made.

There are many other contributory causes to a condition that fails to use available manpower as it should be used. Abnormally high "quit" rates in many war industries are a critical problem. Any sophomore knows that a plant cannot have a labor turnover of 100 percent in twelve months and achieve anywhere near the output per manhour that could be attained if it had a stable working force.

Labor hoarding is another factor, understaffed supervision still another. Management is not blameless, for in some places it is not equal to the task imposed upon it. Neither is the government blameless, because it has hesitated to crack down when obviously no other recourse would bring the desired results.

One point is conceded by top production authorities in the government. It is entirely possible in many, many spots to turn out a considerably larger volume of war goods than at present without increasing manpower by a single person.

What is needed to get maximum production per manhour worked is *the will to do it.* And along with that resolve we must possess, particularly in government, the courage to secure the desired results, regardless of who may be hurt in the process and regardless of political considerations.

Burnham Finney

Gaging Business

Manpower is now the No. 1 limiting factor in war production. Upon the country's ability to secure more men and women for its factories and to use more efficiently its present working forces depends the success or failure of meeting the very high goals set up for this year and next.

Existing facilities in some lines are partially idle because of lack of manpower. The steel casting industry is operating at only 70 percent for that reason. Washington finds it impossible to man a new iron ore mine in the East. More labor is needed in aviation, shipbuilding, aluminum and magnesium, to name a few examples.

The nation's war output today is about equal to the rest of the economy combined, measured in dollar volume. August production was up a bit, but not enough.

Raw materials are causing little anxiety anymore. No military program is being seriously cut back or curtailed for want of steel and an increasing amount of steel is becoming available for essential civilian requirements. Steel plate is exceedingly tight and will continue so until new facilities come in at the year's end.

A small stock pile of aluminum is being built up, though only a short time ago officials thought such an achievement impossible for at least a year ahead. A considerable percentage of aluminum extrusions is now being stored against future needs.

The components and parts situation is steadily improving. Valves have been the worst of all, but production is rising and a few months hence conditions will be much better. Bearings are short and the stringency will continue indefinitely. Pumps of certain types are scarce.

Ship construction in August came close to the all-time peak reached in May. The year's schedule of 20 million tons will be attained. A comfortable situation in shipbuilding has tightened, however, because of the demand for more ships emerging from the Quebec Conference. Propulsion machinery no longer is the problem that it was a short time ago.

Machine tool output declined last month to around $90,000,000. Rough estimates for September put production at $80,000,000. A rapid decrease is anticipated during the fourth quarter.

Backlogs in machine tools are down to $450,000,000, about half of which is for Lend-Lease. Order books will dwindle in the coming weeks. The shrinkage in machine tool business has been greatly accelerated by the artificial brakes applied by official Washington. Some observers feel that perhaps the restrictions imposed may have been too drastic.

Washington predicts that machine tool production in 1944 will be between $250,000,000 and $500,000,000. Realists in the industry put the figure around $325,000,000. Output this year will be well over $1,000,000,000.

WMC's "Buffalo Plan" Approaches Manpower Draft

Industries given manpower priorities by labor requirement board; heavy industries like the plan—factories with higher wages don't; USES check shows labor advantage

WASHINGTON—War Production Board is concerning itself primarily with manpower, and the old idea that it should deal but with production while War Manpower Commission handles labor has gone a-glimmering. Raw materials, plant and component parts have ceased to be WPB's prime worry as scheduling and completion of production facilities has eased pressure in these fields. But while that was going on, manpower was rapidly being gobbled up by hungry expanding industry.

Of late, manpower has been the bottleneck, and the production men—Donald M. Nelson, Charles E. Wilson, and their aides—are taking more and more initiative in matters which, on paper at least, belong in War Manpower Commission's province.

Both War Department and (unofficially) WPB are opposed to a national service act. The board does not harbor the illusion that a work draft law would make a quarter of a million workers grow where none grew before. But it does feel that present controls, which go about as far as it is possible to go without introducing compulsion, fall far short of providing the maximum utilization of the existing labor force.

In an effort to nudge WMC into using to the limit what powers it has, WPB is demanding that the most drastic controls possible be applied to Los Angeles, San Francisco, San Diego, Portland and Seattle, where ship and plane output are being impeded by labor shortage. As a result, WMC is readying its "Buffalo Plan," most severe manpower regulation program in its record of experiments.

The Buffalo Plan

In effect at Buffalo for only about two months, the plan essentially sets up labor priorities according to the essentiality of the work being done in each plant in the community. The plants with top priority, would have the first right to available labor. Labor would be taken from non-essential plants and asked to transfer to essential plants, or from less essential to the more essential plants.

Controlled by Board

At the heart of the Buffalo plan is a 5-man labor requirement board, headed by non-voting Chairman Edward Barcalo, retired president of Barcalo Mfg. Co. Four government members represent Army, Navy, National War Labor Board and WMC. This group is given confidential requirements and production information by the armed forces, the WPB, and other agencies concerned with production of war material. On the basis of this information, it draws up a list of firms whose need for male help is deemed most pressing.

Hiring Through USES

Every man hired in the area must be passed through the United States Employment Service office.

In the first few weeks after the plan was established on June 14, approximately three-fourths of all male applicants at the USES were sent to firms on the requirements board's priority list. Later the trend was the other way because of the influx of schoolboy vacation workers.

Not every male applicant for a job is sent to a firm on the secret priority list. There is, in addition to the priority firm's needs, the factor of the utilization of a man's highest skill to consider. If a priority firm cannot use a man at his highest skill, he will be referred to another firm.

Benefits Vary

The heavy industries, such as the steel mills, machine shops, and the like, have in the main reaped the greater benefits. Their rivals in the labor market, with their higher wage scales, are not so happy.

Labor has two major complaints: first, that under the present rules many men are being referred to jobs that have lower starting rates than they enjoyed in previous positions; second, that the appeal procedure is too slow. However, in a USES spot check, 62 percent of the males referred during a 3-day period were sent to plants where the starting rate was higher than it was in the firms they had just left. In 27 percent, the rate was the same. In 11 percent—mostly unskilled—it was lower.

Weak, But It Works

While the plan still has a few bugs and irritating wartime restrictions, no better plan has been devised, and since it was established, production records have been much improved. War officials frankly admit the plan is not perfect. It's the nearest approach they have yet devised to a national service act without teeth.

After the Buffalo plan is put in effect on the West Coast, it will be set up in the Connecticut Valley.

Field Office Review of PD-3A Causes Delays, Limits Buying

WASHINGTON—War contractors are reported having extreme difficulty in securing permission to buy new machine tools under the new procedure whereby applications are reviewed by district offices of the War Production Board. Applications for PD-3A first go to the contracting officer who decides whether the contractor needs the machine and then to the field office for consideration. Contractors often do not realize that they can file an appeal with their district office when an application is rejected, the appeal being forwarded to Washington.

Supposedly having complete information on available new or used machines in its own area and on idle subcontracting facilities, the field office is required to approve the application in 10 days or send it back with a suggestion for doing the work without buying a new machine tool, either by subcontracting or buying an existing machine. Recommendations of the district offices are sent to the Facilities Bureau of WPB in Washington. It is this bureau that sets up criteria for examining applications of contractors for new machine tools.

An attempt has been made to grant requests for machines when contractors can submit proof of substantial savings in manpower and of the speeding of production. WPB, on the other hand, wishes to guard against the tendency of some contractors merely to use the existing device for further modernizing their factories.

Delays Reach Three Months

In actual practice the delay in granting or denying applications is reported to run from three weeks to three months, instead of ten days. Many applications are returned to contractors without any suggestions. To be sure, numerous applications are not made out correctly in the first place and there is no information in them to warrant the field office in issuing a priority. In many cases the suggestion made by the field office is unworkable because of confusion about the types

SHOULD REPORT INABILITY

WASHINGTON — Manufacturers of Class A Civilian type end products, who have received allotments and authorized production schedules from various claimant agencies and from a WPB Industry Division, and who discover that because of labor shortage, lack of capacity, delays in material deliveries or other causes that they will be unable to meet all authorized production schedules, should report the matter to the appropriate WPB Industry Division so that it may furnish directions, the War Production Board has announced.

of machines needed, a confusion which is understandable because of the unfamiliarity of WPB district personnel with machine tools.

Net result of the new procedure the last few weeks has been to restrict purchases of machine tools required for war production and to bring about delays. The situation is more acute because machine tool builders now face a period in which they will be manufacturing solely on the basis of customers' orders received rather than pool orders. The sharp falling off in demand impels them to take subcontracting into their own plants. The danger is that a sudden and unexpected demand for machine tools will find machine tool builders unable to meet the demand.

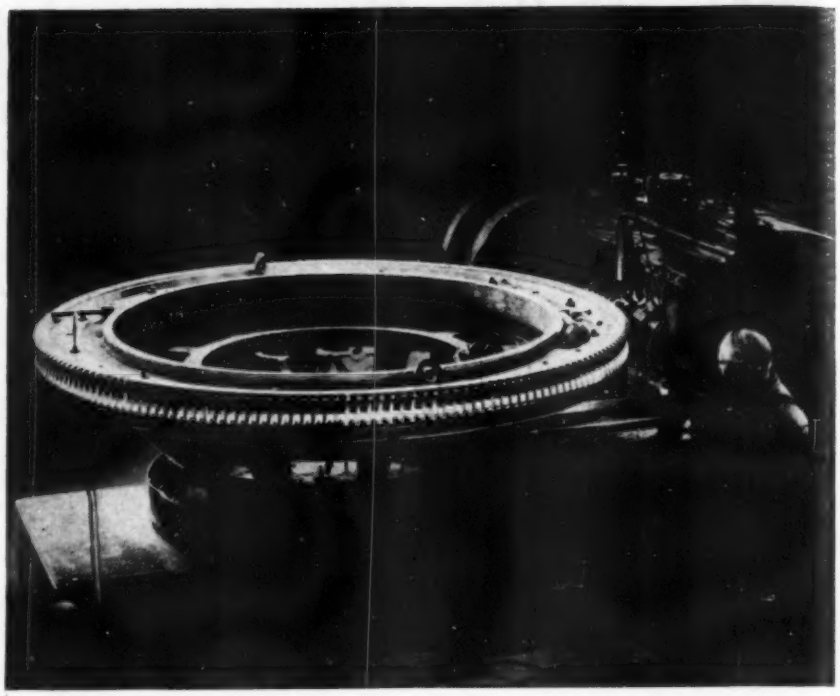
Change Steel Warehouse Rules to Speed Delivery

WRIGHT FIELD, DAYTON, OHIO—To meet current problems in distributing steel through official aircraft warehouses, the Aircraft Scheduling Unit has effected three new features for expediting deliveries to aircraft contractors.

Official aircraft steel warehouses are now permitted to accept back orders from aircraft contractors for small quantities of earmarked steel, but may not hold the materials in the warehouse to fill these orders.

The Aircraft Scheduling Unit has authorized the Materials Coordinator in the district procurement offices to issue releases on all items, except steel tubing, which are required in quantities of five tons or less. For releases of quantities greater than five tons, it will be necessary to have the formal release made by ASU after certification by procurement district office.

To assist manufacturers whose requirements for alloy steel—if specified over the period of their contract—would amount to extremely small quantities per month, ASU has advised these contractors to utilize the provisions of the Controlled Materials Regulation No. 2, paragraph C3.



Goliath Gear—Believed to be the highest capacity right-angle reduction drive gear ever produced by a generating process, this 97.5 in. outside diameter cone-drive gear is one of an order recently produced at one of the plants of the Cone-Drive Division, Michigan Tool Company. Reduction rate is 192 to one

To Try to Curb High Turnover Of Labor in West Coast Plants

WASHINGTON—No report has been made of the findings of the Aircraft Production Board and Charles E. Wilson, WPB vice chairman, during their recent fact-seeking trip to West Coast aircraft factories. It is understood that they found the severe manpower shortage to be caused by excessive separations with little new hirings, aggravated by the proximity of shipyards paying higher wages.

Marginal Workers Quit

Inasmuch as a large portion of the personnel of aircraft factories consists of women workers, a very high percentage of the separations have been women. These employees may be largely looked upon as marginal workers: wives of service men temporarily stationed on the West Coast; women who left peacetime jobs to take aircraft manufacturing employment, only to find it less attractive than their former work; housewives who tried unsuccessfully to run a home and handle a job; and women who found the strain of work plus difficult transportation was too much.

Many of the aircraft factory communities are crowded, so importation of additional workers is impractical, and it is essential to make the best of the labor force available.

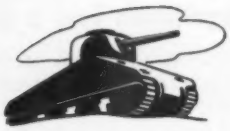
The procurement agencies are cooperating by not putting contracts into labor-shortage areas, or areas where community facilities are strained. It is understood that contracts have even been cancelled in such areas and moved to ones with less acute manpower situations.

Many Angles to Problem

In a press conference, Paul McNutt, director, War Manpower Commission, was asked what was behind the manpower troubles of the West Coast plants. He replied, "There are a variety of problems: turnover, absenteeism and community facilities and some management factors."

Asked if WPB Vice Chairman Wilson had asked for a continued stay of induction of aircraft workers, Mr. McNutt replied "there can't be any continued stay of induction."

It is believed that much of the present picture of production on a plateau is due to the great degree of success with which other production-increasing programs have met, and that we are reaching the extreme limit of machines and manpower. Blowing air into a football bladder becomes harder with each succeeding puff.



Inside Detroit

Industry and WPB see piece work as solution to manpower shortage, but union has to be sold. Tank building cut, leaving GM and Chrysler in the field. Postwar helicopter looks hot. Kaiser jeep tests favorably. All-GM plane to be produced

BY SILER FREEMAN

See Piece Work As Solution The automotive industry, nearing the bottom of the barrel on manpower and with schedules soaring for the last half of 1943, is grasping at the return of piece-work or some other incentive method to boost production without increasing present employment. A showdown is expected before long.

The 16 demands, laid down by General Motors in negotiations just opened with the UAW, are believed to be the opening gun or the sounding board to see what the union's latest arguments will be against incentive systems. Most of the GM demands are just so much smoke screen around the principal one, sanction of the piece work scheme.

It's Been Left To Industry Whether it is for the industry or for the War Production Board, GM is sounding out the union as a last, desperate try to bring output up in the depleted labor market. WPB has expressed itself in favor of the incentive plans but has left it up to the companies to put it over.

Industry's own critics are not blaming the union too much for being reluctant about accepting piece work again. The abuses of the past are still too fresh in the workers' minds. The unions will fight for ironclad guarantees before they accept it willingly.

Union Favor Based on Cash Some observers believe that the only way the UAW will allow a piece work clause in the contract will be if there is no other way to get their members more money. The union must show the membership some results financially and if piece work is the only way, it will yield but only under strict safeguards.

Officials of the larger corporations estimate that an incentive system would bring a jump in production of from 15 to 25 percent from the same number of employes. The type of new workers still available is far from peacetime standards and does not turn out the amount of work proportionate to their numbers. Piece work, however, will make up for this lag, the officials believe.

At least one automotive company has installed the incentive plan but not in the Detroit area. Packard, in taking over the Toledo factory, was forced to adopt it to compete with other Toledo industries for workers. So far, one of the company executives stated, it has not been in operation long enough to see what are the results, compared with the Detroit plants where no incentive plan is used.

Tank Output Narrows After September 15, only two automotive companies here will be left in the tank-building field. Ford's contract for tanks and tank destroyers runs out at this time and GM and Chrysler will carry on in that field.

The Highland Park plant, where the M-4 and M-10's were being built by Ford, will be devoted almost entirely to making aircraft parts and sub-assemblies. Many of the Rouge operations on the Pratt & Whitney engine are being shifted there, while some Willow Run operations are being sent to Rouge.

It is a constant reconversion in the automotive industry.

Helicopter Seems Sure for Postwar Anyone who poohpoohs the helicopter as a postwar industry should talk to some of the steel company representatives. One who supplies special steel for the rotors used on the helicopter stated confidentially that his company had orders from 62 different companies.

Nothing in these hectic times has captured the imaginations like the helicopter. It has stirred up even more talk than Henry Kaiser's $450 postwar jeep.

Kaiser Car Test Is Well Received And on the subject of the Kaiser jeep, word has gone round that the pilot model is about ready for tests at Aberdeen. On the same day that the well-publicized but bogus story of the acquisition of a plant to build the military car was being front-paged in Detroit, the first model was being tested on the Ford test track in Highland Park.

Two other models have been built since then. Initial tests are said to be highly successful and a high officer in Tank-Automotive was reported to have been amazed after driving it.

An All-GM Plane Coming General Motors is about to come out with its first all-GM plane. It will be a fighter of an

Supercharger Checker—Because they revolve nearly 25,000 times a minute, or at the rate of about 867 miles per hour, the rotors of the new 2-speed 2-stage superchargers that helps Packard-built Rolls-Royce engines do revolutionary things to a fighter plane must be delicately balanced to one one-hundredth of an ounce-inch

Production Boosters—Two sailors and a marine, each recently returned from combat areas, members of the crew of a mobile "Steel for Victory" exhibit prepared by the Navy to stimulate steel production, examine a 500-lb. Jap bomb

entirely new design, using the large Allison engine. It will be assembled in one of the corporation's division and the parts will be built in the other divisions.

GM is more than 50 percent in aircraft work but has only contributed parts to the planes on which it has been working. The fighter, however, will be its own, from the drawing board to the final inspection.

Canadian Shipyard Workers Transferred to Meet Needs

VANCOUVER, B. C.—Re-organization of employees of Vancouver shipyards is now under way. Men are being transferred with a view to overcoming the man-power shortage and provide labor for work of a higher priority than cargo ship construction in progress at some yards.

Shipyard officials, while refusing to divulge details of the new work, definitely denied reports that the seven-day continuous program which has been in operation in the B. C. yards is being abandoned.

Production will be maintained, it is stated, on a continuous seven-day operation, but new work, which is reaching the yards, is considered to be more urgent than the freighters previously built there.

Yard managements, as a result of new work and manpower shortage, have been given permission by Wartime Merchant Shipping to re-arrange their man-hours to meet the situation. Each yard is being given a free hand to obtain best results in each case. This re-arrangement is already under way. One yard has greatly reduced the graveyard shift, and somewhat reduced the Sunday working force. Men affected are being used elsewhere. It is emphasized that there will be no great layoff upheaval.

Halt Dormitory Construction

One major result of the situation has been temporary halting of construction of new buildings for women and shipyard workers at North Van Ship Repairs and South Burrard. This is a temporary measure, and the action was taken because Wartime Shipbuilding has no means of telling until re-arrangements are complete how many more women the yards will need. Women are still to be employed in the yards, but the number to be added to present lists will have to be decided when the present situation is cleared up.

Launching Time Extended

One shipyard manager states that launching times for cargo ships which used to hit water 60 days after keels were laid has been extended to 80 days. It is explained that the first type of cargo ship built in Vancouver could be turned out more quickly than the present Victory type.

However, there is no doubt that the re-arrangement of working forces to handle new jobs is already affecting the freighter production.

Congressional Amendment of Renegotiation Law is Urged

CLEVELAND—Amendment of the renegotiation law to permit manufacturers whose wartime production is using up their postwar market to retain a larger percentage of their present earnings is urged by the National Machine Tool Builders Association.

Outlines Amendment

The Association suggested that amendment be made along the following lines:

"1. Renegotiations wholly in the light of profits after taxes.

"2. Due allowance should be made for the peacetime use inherent in the equipment after the nation's war needs have been met.

"3. Companies which have saturated their postwar markets by reason of wartime production should be permitted to retain out of their earnings the reserve necessary to maintain their service to the industries dependent upon machines already installed, to finance the engineering research that leads to new developments, and to finance those new experiments to production for use."

Machine tool output was stepped up from $200,000,000 in 1939 to $400,000,000 in 1940, $775,000,000 in 1941 and $1,320,000,000 in 1942.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

AUTOMOTIVE PARTS—Manufacturers have been granted additional time, until Oct. 1, in which to furnish customers with required price lists, catalogs and notices of resale maximum prices. Effective date of regulations remains Sept. 2. (Amendment 1, Regulation 452.)

BERYLLIUM COPPER SCRAP—No person other than a producer or an approved smelter is permitted to melt, reprocess, smelt or otherwise use this scrap unless specifically authorized by WPB on application by letter to the Mica-Graphite Div. (Conservation Order M-160-a.)

OFFICE MACHINERY—Termination date of Form PD-688 used by manufacturers in applying for authorization to process permitted types of machinery has been extended until Oct. 5. (Amendment to Limitation Order L-54-c.)

STEEL PIPE—Standard specifications for steel pressure pipe, tubes and other types of pipe have been established in order to obtain maximum production from existing facilities. (Schedule 11 to Limitation Order L-211.)

STOCK REPLACEMENTS — Producers of controlled materials, permitted to maintain mill stocks, need no longer replace shipments from such stock within 60 days from date of shipment. (Amendment to Direction 15, CMP Regulation 1.)

Wartime Washington

Producer-procurement agency relationship has attained a lap fit and WPB field offices can now handle the job. Manpower more acute. Management has responsibility of keeping up production to war end. Abandonment of featherbeds asked

See Management From Field

The time for decentralization of War Production Board activities definitely has arrived. This is the belief of top officials, who think that the war production effort can henceforth be more ably administered from the field than from Washington. From now on you can look for more authority to be wielded by the WPB's regional offices. Already the effect is seen in Washington, where the horde of manufacturers has decreased substantially and the capitol is less frenzied than it used to be. It is true that the summer heat and the absence of Congress have contributed to a quieter period, but that is by no means the full explanation. Better organization of war production as time passes makes for a more orderly situation.

Manpower, the Limiting Factor

Wherever you go in Washington, manpower is the chief topic. There was a time when plants and equipment were the main limiting factor, but they are well in hand. Since our war operations first began, it is estimated that more than 25 percent has been added to the country's productive facilities. The materials situation also is well in hand. Many items are tight—steel, copper and rubber for example—but lack of materials is not seriously holding back any of the war programs. Output in the months ahead will be measured largely by manpower available.

The worst spot of all is on the Pacific Coast. Over 250,000 more workers will be needed there before the end of the year, and Washington frankly doesn't know where they are coming from. The employable men and women and the facilities to house them aren't there. As one high official remarked, "You can stuff just so many people into the confines of a given area and that is all. Many cities now are bulging at the seams." The same condition applies in other parts of the country. Today there are 55 critical labor areas in the United States. Washington expects the number to increase 75 or perhaps 100. As a possible help in the current and approaching manpower crisis the so-called Buffalo Plan is being put forward. It is discussed elsewhere in this issue.

Management's Test to Come

War officials are convinced that the real test of management lies in the period immediately ahead. Better utilization must be made of plant facilities and of labor. Top WPB people insist that manufacturers have the responsibility for delivering on time on war contracts after they have once accepted the schedules proposed. If they know or feel that they cannot reach the goals named in the schedules, they should not accept the contracts in the first place. There are extenuating circumstances, of course, in which manufacturers are excused if they fall down on deliveries. The coal strike is an example, temporarily affecting steel production adversely. What friends of industry in Washington are apprehensive about is that industry, after having done a superb job thus far, may relax its vigilance and kick the job around at the end. Such fears arise from the belief around the country that the war is "in the bag."

PLAN MORE TOOL PURCHASES

WASHINGTON—A plan is now under consideration whereby the British will increase their purchases of machine tools in the United States and decrease the volume built in England to release a considerable percentage of skilled workers in British machine tool factories for use in munitions plants. Because of its effect upon manpower and materials, the plan must receive White House approval before it becomes effective. Such approval is not yet forthcoming and, in fact, may not be granted. Under no circumstances will the British machine tool industry be shut down or will all of Britain's machine tools be built in this country, even though the plan should be adopted. Not more than 20 to 30 percent of the British requirements would be bought here. In dollar volume, the amount would involve some $75,000,000 to $100,000,000 a year.

Unions Asked To Help

To get better use of available manpower Washington is quietly trying to persuade unions to relax their rules and regulations as to qualifications of men to do certain jobs and as to so-called feather bedding. This matter involves interunion and intraunion relationships and the right of members of one union to do the kind of work that trespasses on the work of members of another union. A case at hand is the agreement of a union at an undisclosed shipyard to permit shipfitters to do tack welding. The result is that the amount of tack welding being done today is double that formerly done, thus speeding ship construction. The statement has been made privately by authorities that millions of manhours could be saved if the boilermakers would modify their working rules. But no one appears willing to crack down. Emphasis is put on the fact that all action must be on a voluntary basis.

Labor Turnover Causes Concern

The "quit" rates in war industries are most disturbing to Washington. They are alarmingly high. In some industries they have been averaging eight percent a month or not far from 100 percent a year. When one realizes, however, that perhaps half of the labor force is fairly stable, the amount of moving around by the other half is tremendous and is demoralizing to the efficient operation of plants. The percentage of "quits" in the hot rooms in metal producing and metal fabricating plants during this summer has been of staggering proportions. In one industry alone it ran higher than 40 percent. The "quits" in Los Angeles is especially high in all industries and in all departments.

Tank Production Is Cut Back

More information has come out about cutbacks in tank production, which have amounted to 40 percent this year. The reduction in dollar volume is one-third. The Russians cancelled orders for 5,000 tanks and the British followed suit. The Soviet forces needed trucks and locomotives and food more than they did tanks. In addition, estimated requirements for the U. S. Army dropped some 10 percent. Lima Locomotive, Baldwin and American Locomotive were the first plants affected, being shifted to locomotive production. Pacific Car & Foundry and Pullman Standard have converted to airplane parts manufacture. Nineteen forty-four output of tanks will be larger than 1943.

Demonstrate Ordnance Units

Going all out for bond sales, the ground force of the Army is staging an open air show

IDLE STEEL REPORTS CLOSING

PITTSBURGH — If you have some idle or excess steel, the Steel Recovery Corp., 5835 Baum Boulevard, here, will continue to accept reports only until September 30, 1943. Inventory reports post marked on or before that date will be catalogued as subject to the special "higher than scrap" prices established under recovery program.

The corporation has announced that it has available about 400,000 tons of steel in a variety of shapes and forms that can be used by manufacturers of certain permitted civilian products, whose production is governed by the amount of steel received through CMP allotments. These frozen steel stocks listed by the SRC can be used by manufacturers over and above their CMP allotments.

around the Washington Monument to demonstrate various ordnance material. Shown are field guns up to 8 in., one of every type of Army vehicle now in use, including 60-ton tanks, and enemy equipment so newly arrived in this country that it hasn't yet been studied. Among the enemy equipment is the Mark 6 tank and the Volkswagen. Complete remote control demonstrations of the 90 mm. anti-aircraft guns will be held. A railroad spur has been extended to the monument grounds to bring Ordnance railroad equipment to the exhibit.

Oppose Lower Priority

WASHINGTON — Proposed reduction in priority ratings for key components on industrial instruments would be detrimental to the industry, members of the Industrial Instrument Advisory Committee agreed at a meeting with the War Production Board representatives, here. The proposed basic rating assigned to industrial instruments is AA2-x, the committee was told.

Members of the committee pointed out that the industrial instrument industry used only a small percentage of the overall production of key components, but that industrial instruments should have a priority rating commensurate with their essentiality as key equipment producers for practically every vital war program.

The industrial instrument industry faces special problems because of the wide variety of products included in its scope, Ernest A. Capelle, chief of the Industrial Instrument Branch of the Radio and Radar Division of WPB, said. These products include pyrometers, temperature controllers, industrial thermometers, pressure gages, control valves, gage glasses and steam engine indicators.

Experience Indicates Contract Termination a Lengthy Affair

NEW YORK—Concerns faced with contract terminations will find that winding up tag ends of the business is a lengthy matter. Often costs are deferred, and some elements of cost are so intermingled with general administrative burden that it is difficult to separate them for proper checking by government auditors. Disposal of inventories is a knotty problem. If a firm is handling a number of war contracts, it may be prudent to establish a special department to deal with termination problems, so that efforts of the organization as a whole are concentrated upon getting into production of new war orders.

Some insight into termination difficulties is provided by the case of an upstate New York manufacturer. This firm took a contract to make boring mills, produced one or two, and then the contract was cancelled six months ago because of a shift in plans by military departments. Liquidation of inventory is still going on, the firm does not expect to be paid in full for its efforts until some months ahead, and certain costs attributable to termination will fall into future periods.

Disposal a Big Task

During this six-month period, the treasurer of the firm has spent a major portion of his time upon disposal of inventory and compiling lists of leftover parts, sub-assemblies, purchased electrical equipment for government agencies, who have broadcast the information in an attempt to find other contractors in need of such items. In view of the shortages existing, company officials have shied away from seeking to scrap government property without regard to its intrinsic value and potential worth in the war effort. Considerable correspondence has been carried out with potential users, yet because of the nature of the contract, it has been difficult to find buyers. Meanwhile storage space is tied up.

The cost of storing and selling these items under government approval may be collectible, but it is questionable what share of administrative burden is chargeable.

Labor turnover is unavoidable in the case of a contract termination involving the major share of a company's war effort. The natural attempt to keep the best men busy until a new contract is ready for production is a cost that the manufacturer must absorb. Hiring and training replacement workers is another.

This particular company states that it has had fair and intelligent treatment from government agencies concerned with termination. Loss of an order in normal times is a disturbing factor to production and costs, while a changeover is in progress. In the case of a war order, the nature of the work is so different that many times the effort is required by administrative and supervisory personnel to get matters straightened out. Vexing problems of inventory, storage, interpretation of contract terms and government regulations, decisions that must be affected by patriotic considerations—these combine to drag out termination difficulties for months. And the incidental costs are likely to be felt long afterward.

V-Loans Liberalized to Ease Cancellation Shock

WASHINGTON—Government guaranteed V loans will be made available to war contractors and subcontractors on a much broader basis than heretofore, effective immediately, under a plan jointly announced by the War and Navy Departments, the U. S. Maritime Commission and the Federal Reserve Board.

The plan is designed to assure contractors that their working capital invested in war production will not be frozen in the event of contract terminations. Interest on loans guaranteed under the new program will be assumed by the Government upon termination of contracts as under present Regulation V guarantee.

To Reduce Lag

This decision to broaden industrial credit facilities was reached with a view to preventing any lag in war production, which might be caused by fear on the part of contractors that their capital would be tied up as contracts are cancelled in response to swiftly changing war requirements.

In the past, advances under V loans have been restricted, in general, to working capital needs for war production. The broadening of the plan will enable contractors to obtain the use of most of their own working capital immediately upon termination of their contracts. Banks will be enabled to make such advances at once, with a minimum of complications.

The services stress the fact that cancellation of contracts must not be construed as marking the beginning of a general curtailment of war production. On the contrary, with the war rapidly becoming one of movement, with great Allied offensives in progress and in prospect, materiel requirements are subject to sudden and unavoidable changes, and it is essential to remove all possible causes of delays in war production.

Spotting The Air News

Aircraft manpower requirements must draw men from fighting forces and from the manufacture of other goods. NACA's exhaust-heat de-icing system installed on Consolidated-Vultee planes. Contract termination interests plane producers

Either way you look at it, the additional workers to make more planes will have to come out of plants producing other goods. Conservative Army and Navy officers will have to give up part of their ground and sea force programs; Army and Navy will have to yield a measure of its requirement for fighting men; and Congress probably will authorize the Manpower Commission to put men in aircraft plants, and wherever else they are wanted.

It is extremely difficult for the government, and for the Army and Navy, to whip up much serious concern when the public knows that Germany's air power is growing weaker and ours is growing stronger. The Luftwaffe, scattered over Europe as it is, frequently cannot lift a fighter in defense or attack. Any one of the Allies alone now has more aviation than the Germans have. Everybody knows that the Nazis are rocking on their heels and will be licked. Washington's problem is to keep the country in the ring to lick them quick. It should be said again, to those who have misunderstood, that our aircraft production is not falling off. It is going up, but the rise is slower than planned and we are behind schedule.

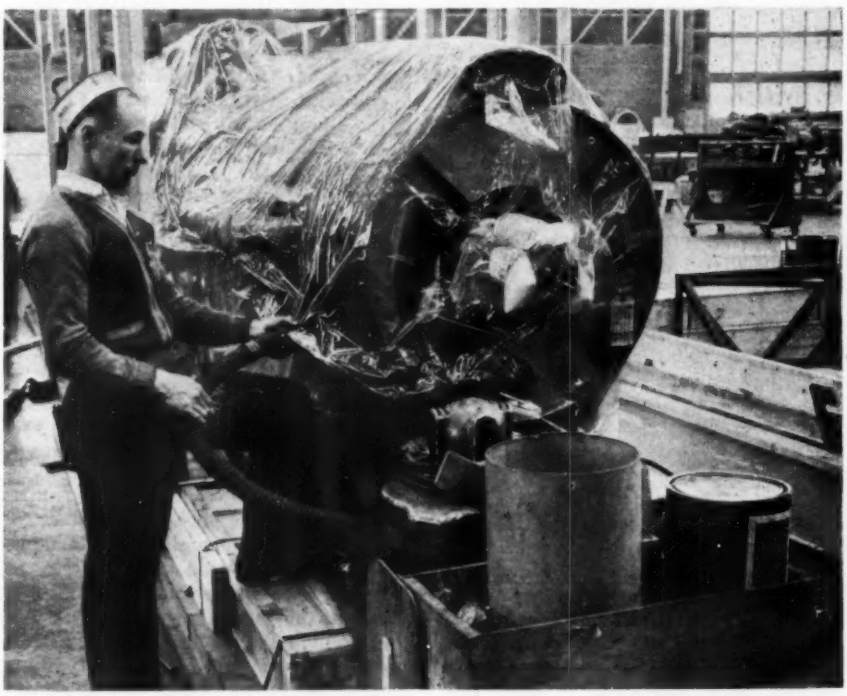
The Washington war command still doesn't know how to lift aircraft production above 7500 per month where it has hit ceiling in the rarified manpower atmosphere. Critical lists of aircraft occupations and limited blanket exemptions from military service, and incentive pay plans, all sound good enough but they are not going to put production up to 10,000 per month or anywhere near it, and the industry and the government both know it. This world capital is in a painful dilemma. Aviation is winning where other arms cannot be brought to bear, yet the tank generals and battleship admirals are all fighting for production of their own particular pet weapon instead of airplanes. Practically every war agency in town has an oar in the rough water.

It would be easy to raise airplane production to almost any desired rate if the energy now devoted to some other kinds of weapons and supplies were transferred to the aircraft plants. This will be done only on a limited scale because the general staffs of the United States and Britain are not ready to try an all-air war. They are only flirting with the idea. When the results of bomb damage already done to Germany begin to show up in their armed hitting power some months in the future, the Allies may make up their minds, but not now.

Rivalry between air and surface forces, however, is only part of the trouble. The real problem is the old democratic dislike of compulsion. The government controls its materials, but it doesn't control its workers. It's illogical, but it's very real. Men are ordered to leave home and all they possess and to take battle stations all over the world. But they are not ordered to leave a Richmond (Calif.) shipyard and go to work in a Los Angeles airplane plant. There is no law under which they can be told. But there may be one soon. All these manpower winds are blowing in that direction. Unless somebody bobs up with a very bright idea pretty soon, Congress, when it meets in mid-September, will be asked to take this manpower thing in its lap.

De-icing of wings has occupied researchers for years. Ice is a serious menace in war as well as in civil flying. It not only loads the plane but it acts as a "spoiler"—changes the shape of the wing and greatly lowers its efficiency. Several years ago the National Advisory Committee for Aeronautics came to the conclusion that heat, conducted through the wings from the engine exhaust, was the most promising of several de-icing methods. NACA's work on heat de-icing bore fruit the other day when Consolidated Vultee announced the system had been installed in some of its war planes. Consolidated came first because it so happens that the B-24 wing is a highly-refined design and is most seriously affected by the rubber de-icing boot which is in common use. That is, the boot acts as a spoiler, even when there is no ice. The boot runs along the leading edge; it is pulsated by air pressure, breaking the film of ice when it first forms.

The new heat system is all inside the airfoils, including the tail structure, and does not interfere with air flow. This system will be applied to other types of planes. After the war it will become standard practice on commercial planes, unless a better system is found. Icing of carburetors has



Raincoat Collapser—A workman in a plant of Curtiss-Wright Corp's. Airplane Div. collapses the 30-ft. long, 400 ft. square pliofilm "raincoat" covering of a Curtiss (P-40) fighter plane engine, preparatory to shipping it off to a war front securely protected against the elements during transit

long been prevented by exhaust heat. Propeller icing is still a difficult problem. Ice not only cuts propeller efficiency, but causes racking vibration.

Contract termination, liquidation of war plants, and disposal of war surplus equipment are three important matters of interest to aircraft producers, which will be taken up by the fall session of Congress. Several bills have been introduced on each subject. Uncertainty on these problems is bound to cause worry and inefficiency in manufacturing, and Congress is expected to work on them in earnest. Already the Army has terminated some 5000 contracts, the Navy about 1500. Not all have been handled expeditiously. Industry wants no repetition of long-drawn negotiations that followed the last war.

Tool Plant Is Converting

CINCINNATI—The Lodge and Shipley Machine Tool Co., operating two plants here, with a backlog of lathe orders covering four months future productive capacity, is proceeding on plans for converting facilities and manpower as subcontractors on various types of war production. Production of Diesel engine parts, aircraft propeller parts and several new types of products are projected in the conversion program.

Work on the Diesel parts has been under way for several months. The propeller parts operations will get started within several months, as the company reduces its backlog of lathe orders.

British Tool Output Tapers

LONDON—British producers, according to a recent statement of the Minister of Production, published in *The Machinist*, are reaching the point of production where the chief tasks lay in "developing the finesse" of new weapons, and in securing the greatest output of improved efficiency rather than by striving for more volume. He added that munitions output in the first quarter of this year exceeded that of the same period in 1942 by 40 percent.

Reports indicate a lull in business for some sections of the machine tool industry, *The Machinist* continues. This lull could be partially overcome by a serious overhaul of existing production and tools with a widespread replacement of worn plant by new.

Below the category of high-priority work there is a large volume of legitimate business that could be set in motion. Many hundreds of small production firms would also gladly seize an opportunity for increasing production capacity by laying down new plant. They have been discouraged from doing that.

Steel Makers See Cost-Ceiling Squeeze; Wildcats Are Sentenced

PITTSBURGH—The rising cost of making steel may be given another boost with the governmental approval of a 48-hour work week in the coal mines, and the increased overtime is expected to cost $1.50 per miner day. But as they watch their mounting expenses, producers feel the OPA will not raise price ceilings as long as the steel firms show a reasonable overall profit and the dividend checks go out to the stockholders.

During the past months, increased overtime due to the 48-hour week in the steel industry, a decline in the output per employe because of inexperienced help, and greater transportation charges are factors skyrocketing the costs of making steel. Some sources report that since 1939, the costs on some regular steel items have increased as much as $3 to $6 per ton, indicating losses on a greater number of items. Another report is that OPA may lift the ceiling on ore prices to $4.60 per ton, compared to an average of $4.24 a ton and with a $4.45 ceiling.

Now the mounting costs in the mining of coal, so vital to steel production, present another hazard to the steelmaker. A price jump for coal would add to the burden of the producer buying in the open market, and would be of no assistance to captive mine operators who would be merely shifting money from pocket to pocket.

From some governmental leaders has come the suggestion of subsidies to the coal operators—which in this case seems to be the government. The policy might be to hold the coal prices at present levels and absorb the difference in operating costs. This could set a precedent for asking further cost subsidation on other steel production factors. While subsidation is conceivable for coal, it is doubtful that price relief would be given in the case of steel as long as steel producers show overall earnings regardless of the declining ratio between volume and earnings.

The high volume of steel business has offset partially the increased costs. The American Iron & Steel Institute revealed recently that the annual capacity of the American steel industry is 90,881,000 tons—a boost of about 10,000,000 tons in the past three years. Relatively low priority ratings assigned to steel plant projects delayed completion of the 96,000,000 ton program scheduled for July 1, 1943 until sometime in 1944. As of last July 1, rated capacity showed open-hearth capacity of 79,867,000 tons annually, 700,000 tons above Jan. 1, 1943, and 6,000,000 tons above the 1940 level; electric furnace capacity of 4,936,000 tons, or 400,000 tons more than on Jan. 1 and two and a half times the capacity available in 1940. There has been little change in recent years in Bessemer crucible capacities which now are rated at 6,074,000 tons and 3,800 tons per year, respectively.

Wildcat Strikers Sentenced

The first prosecution under the Smith-Connally anti-strike act ended victoriously for the government when 27 members of the United Mine Workers of America appeared before Federal Judge F. P. Schoonmaker at Pittsburgh to plead no defense to charges of instigating wildcat strikes in government-operated coal mines in Western Pennsylvania. Judge Schoonmaker denounced the walkouts as attempts to sabotage the nation's efforts in fighting a global war. The miners were given suspended six-months jail terms placed on probation for three years.

The surprise nolo contendere, or no defense, pleas came after Harry A. Estep, reportedly retained by John L. Lewis' UMWA to defend the indicted miners, lost a motion to quash the indictments on grounds the Smith-Connally act was unconstitutional. In denying the motion to quash, Judge Schoonmaker held the law was a valid exercise of war powers. Although the no defense pleas still allow an appeal of the act's constitutionality to the United States Supreme Court, it is believed the UMWA has decided this is not a proper case to test the law's validity. Because of injuries suffered in mining coal, three other miners under indictment will enter their no defense pleas Oct. 11.

Set Relining Record

For the second time this year, workers at the Johnstown, Pa., plant of the Bethlehem Steel Corp., have set a

TO MAKE MORE CATERPILLARS

PEORIA, ILL.—Substantially increased production of "Caterpillar" Diesel tractors for military purposes will be achieved in the near future, it is revealed by Louis B. Neumiller, president, Caterpillar Tractor Co.

Some of the work will be done in the Victory Ordnance Plant, Decatur, Ill., operated by a subsidiary, the Caterpillar Military Engine Co., and much of the manufacturing and the final assembly will be handled in the Berwick, Pa., plant of the American Car and Foundry Co.

world's record for relining a blast furnace. In January, a new mark of 21 days and six hours was established in relining No. 8 furnace at the Franklin Works. Recently, however, this record was eclipsed when a force of 700 workers relined No. 6 blast furnace in the Lower Cambria Mills in 18 days, 20½ hours. Normally a relining job takes 60 days.

BUSINESS ITEMS

The Alvey-Ferguson Company of California has been formed, with sales offices, engineering and manufacuring facilities at Slauson and Santa Fe Aves., Los Angeles, for the purpose of manufacturing and selling conveying equipment and metal products cleaning and finishing equipment similar to the products which are now manufactured by The Alvey-Ferguson Co., Cincinnati. This move was made necessary, according to John C. Walter, president of the new company, because of the great industrial expansion of the West.

The Carpenter Steel Co. announces the appointment of Austin-Hastings Co., Inc., as Eastern New England distributors for Carpenter tool steels, with warehouse stocks located in Worcester and Cambridge, Mass.

Clarostat Manufacturing Co., Inc., manufacturers of resistors, controls and resistance devices, has consolidated all business departments in larger quarters at 130 Clinton St., Brooklyn, N. Y.

Elmer C. Cook and Fred J. Schweizer, formerly sales manager and service engineer, respectively, of the American Gas Furnace Co., have resigned to form the Cook-Schweizer Co., Elizabeth, N. J., to do commercial heat treating.

L. & R. Manufacturing Co. has consolidated its manufacturing facilities, offices and laboratories in a new plant at 577 Elm St., Arlington, N. J.

The Metallizing Company of America has purchased a new building at 135 Cedar St., New York, N. Y. as eastern headquarters for its sales and service operations in that area.

A new department to manufacture metal bonded diamond wheels has been announced by L. H. Metzger, president of Industrial Abrasives, Inc., 3724 West 38th St., Chicago.

Sam Tour, who has been director of the Frankford Arsenal Laboratory for the past two years, has resigned to devote his full time to the newly formed Sam Tour & Co., Inc., with office at 65 Pine St. and laboratory at 45 Fulton St., New York, N. Y.

RotaWings, Inc. has been formed by Agnew E. Larsen, president and Joseph S. Pecker, chairman of the board, and will be devoted to the licensing and engineering for manufacturers of helicopters and accessories. Mr. Larsen was chief engineer and president of the Pitcairn-Larsen Autogiro Co., and Mr. Pecker was a consultant engineer on mechanical apparatus.

NAMES in the NEWS

After three years as chief tool engineer, National Pneumatic Co., Rahway, N. J., William Bickau, Jr. has been advanced to assistant general plant superintendent at the age of 32.

Benjamin H. Bickle, who has been with the Tools Division of the War Production Board for the past year, is returning to the Gleason Works, Rochester, N. Y.

To fill the vacancy caused by the resignation of Gilbert G. Budwig as president of Aircraft Components, Inc., to accept a commission in the Marine Corps, Walter Innes, Jr., chairman of the board has been elected to that post.

The appointment of F. B. DeLong as vice president and general manager of sales for Columbia Steel Co., West Coast subsidiary of U. S. Steel Corp., has been announced by William A. Ross, president of that company. He succeeds J. R. Gregory who was appointed vice president of sales of the newly formed Geneva Steel Co.

C. N. Guerasimoff has been appointed chief engineer of the engine division of the Buda Company, Harvey, Ill. He has served the company as mathematician, engineer on stress analysis, and design engineer on gasoline and Diesel engines, as well as being in charge of development and testing of Diesel engines.

Worthington Pump and Machinery Corp. announces that L. E. Hammer has joined the organization as assistant works manager of its Moore Steam Turbine Division, Wellsville, N. Y.

Lester Hawkins is leaving the Tool Division of the War Production Board to return to Warner and Swasey Co., Cleveland, Ohio.

William Heidgerd has been appointed district sales manager for the Michigan territory of Follansbee Steel Corp., with headquarters in the Stephenson Building, Detroit, Mich. Mr. Heidgerd formerly was director of purchases for The Parsons Co., Traverse City, Mich.

Cutler-Hammer, Inc., Milwaukee, manufacturers of motor control apparatus, has announced the appointment of P. S. Jones as general sales manager. After becoming associated with the company in 1915 as sales engineer, Mr. Jones has since been connected in various sales capacities.

Walther Mathesius

Walther Mathesius, vice president in charge of operations, U. S. Steel Corp. of Delaware, has been elected president and director of Geneva Steel Co., a subsidiary recently organized to operate the new $180,000,000 Defense Plant Corp. steel works at Geneva, Utah. Mr. Mathesius, who will build the organization of the new company preparatory to expected operations of the plant late this year, has been with U. S. Steel Corp. since 1911. He served as general superintendent of Carnegie-Illinois Steel Corp's. South Chicago Works, and in 1935 was made manager of operations of the Chicago District of that subsidiary.

Alfred Marchev, who joined Republic Aviation Corp. early in 1942 as assistant to the president and successively became general manager, vice president, and executive vice president in charge of both the Farmingdale and Evansville, Ind., plants of the corporation, was elected president by the board of directors.

R. J. Minshall

The appointment of R. J. Minshall as president of McCulloch Engineering Corp., Milwaukee, by the board of directors has been announced by Robert McCulloch, founder of the supercharger manufacturing plant, who is resigning effective immediately to undertake a new development vital to the war effort. At the same time, James P. Stewart, Jeanette, Pa., was named assistant general manager. Mr. McCulloch will remain as a member of the board of directors and will serve as consultant to the firm.

In a revision of the executive setup of the Mollenberg-Betz Machine Co., Buffalo, Harold J. Mollenberg has been elected president to succeed the late Henry J. Mollenberg, his father.

The election of Fred F. Murray as president of the Oil Well Supply Co.,

subsidiary of the U. S. Steel Corp., is announced. He succeeds Benjamin F. Harris, who resigned several months ago.

The move of Herluf Nielsen, Ph. D. to the position of chief metallurgist in charge of the technical department at Kinney Aluminum Co., Los Angeles, has been announced. Before coming to Kinney aluminum, Dr. Nielsen spent four years as director of physical metallurgy at Washington State College. Prior to that time he was engaged in research and mechanical engineering for the Combustion Engineering Corp. of New York and the Union Pacific Railroad.

I. T. O'Brien

Chrysler Corporation announces that I. T. O'Brien, for 14 years its general production manager, has been promoted to special representative on the staff of Herman L. Weckler, vice president and general manager, to assist in the executive management of the company. Mr. H. J. Dunn, formerly assistant to Mr. O'Brien, was appointed general production manager of the corporation and W. A. Stickle, formerly supervisor of the central routing department, was appointed assistant general production manager.

Delos M. Palmer, dean of engineering at the University of Toledo since 1934, has been appointed plant engineer at the American Propeller Corp. subsidiary of the Aviation Corp., Toledo. Previous to joining the Toledo University staff 16 years ago, Mr. Palmer was engineer in charge of construction by Westinghouse in Pittsburgh of electric locomotives for the Imperial Government Railways of Japan and was assistant to the factory manager of the Spicer Manufacturing Co.

C. K. Townsend

The appointment of Calvin K. Townsend as assistant general manager of Aircraft Accessories Corporation, has been announced by Randolph C. Walker, president. Mr. Townsend was previously director of contract administration. Before joining Aircraft Accessories, he was associated with the War Production Board in the Washington and San Francisco offices. Prior to that he was for 19 years with Remington-Rand as branch and district manager, handling industrial problems of manufacturing, distributing and financial organizations.

Harry G. Porch, manager of sales since 1900 in the Boston, Mass., office of Lukens Steel Co., retired from active duty on September 1, after 48 years of continuous service with the company.

R. R. Rhodehamel

With his advancement to general sales manager of National Acme Co., Robert R. Rhodehamel marks a 29-year climb from shop errand boy. Mr. Rhodehamel in 1941 was made head of the planning department serving the company's five divisions. In his new capacity, he will concentrate on engineering sales for a wide variety of contract manufacturing work.

W. H. Richardson has been appointed general manager of all activities of all divisions of the Timken Roller Bearing Co. on the entire West Coast and in the Orient. Since 1941 he had been assistant general sales manager of the Timken Roller Bearing Co.

T. H. Wickenden

Appointment of T. H. Wickenden as manager of the development and research division of the International Nickel Co. and of H. J. French as assistant is announced by Robert C. Stanley, president of the company. Mr. Wickenden, who has been assistant manager of the division since 1931, succeeds the late Albion James Wadhams. He is well known in engineering circles in the automotive industry, having been in charge of engineering at Studebaker Corporation's South Bend plant from 1913 to 1920. Mr. Wickenden joined International Nickel in 1922 when he was placed in charge of developments in the automobile field for the development and research department at New York.

Mr. French, appointed assistant manager, is temporarily serving in the Steel Division of the War Production Board, Washington, D. C. He has been in charge of alloy steel development in International Nickel's development and research division at New York since 1932.

Harry T. Worthington has joined the Beardsley & Piper Co., Chicago, as general manager and will direct product development, sales organization and production. He was formerly sales and production executive of Manning Maxwell & Moore.

OBITUARIES

Raymond S. Dean, president of the R. S. Dean Co., Chicago, manufacturers of machine tools, died August 22, at the age of 61. Mr. Dean had been prominent in machine tool and railway circles for many years.

Charles L. Ellis, president of the Downington Mfg. Co., Downington, died, August 30, of a heart attack suffered as he climbed a hill near his home. His age was 71.

Harry C. Tillotson, founder and president of the Tillotson Mfg. Co., died September 1 in Toledo Hospital. He was 76 years old. Mr. Tillotson developed the Tillotson carburetor and established a factory in Toledo in 1914 for its manufacture.

Albion James Wadhams of Dongan Hills, Staten Island, N. Y., a vice president and manager of the development and research division of the International Nickel Co., died at his summer home at Elizabethtown, N. Y., August 22, of a heart attack. He was 68. He had been with the company since 1901.

MEETINGS

American Gear Manufacturers Association. Twenty-sixth semi-annual meeting. Edgewater Beach Hotel, Chicago, Ill., October 25-27.

American Machine Tool Distributors' Assn. Fall meeting. Seigniory Club, Montebello, Canada. Oct. 14-15.

American Welding Society. Annual meeting. Hotel Morrison, Chicago, Ill. Oct. 18-21.

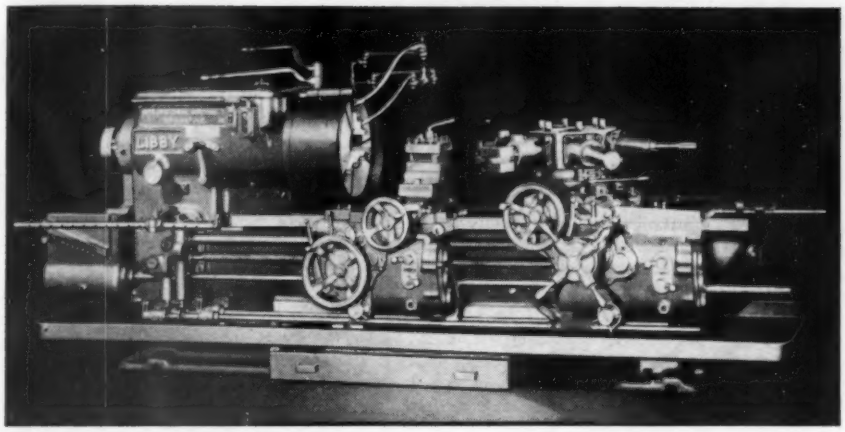
National Metal Congress & Exposition. Annual meeting. Palmer House, Chicago, Ill. Oct. 18-22.

National Safety Congress. Annual meeting. Morrison, La Salle and Sherman Hotels, Chicago, Ill. Oct. 5-7.

Society of Automotive Engineers. Aircraft Engineering & Production meeting. Biltmore Hotel, Los Angeles, Calif. Sept. 30-Oct. 2.

Society of Automotive Engineers. National Tractor Meeting. Schroeder Hotel, Milwaukee, Wis. Sept. 23-24.

Shop Equipment News



Libby Builds Standardized Type H Heavy-Duty Turret Lathes and Fixed- and Sliding-Bed Machines

International Machine Tool Corp., Libby Div., Indianapolis, Ind., has standardized its line of Type H heavy-duty turret lathes and the fixed and sliding bed types. The Type H lathe is made in five sizes, and in addition five standard sizes of the fixed gap turret lathes are available. A sliding bed gap turret lathe of 84 in. swing and a special sliding-bed gap lathe of 150 in. swing are built.

The Libby Model 1H heavy-duty lathe has a 24 in. swing over the ways and is furnished in either a 5¼ or 6¼ in. spindle bore. The turning length capacity is 56 in. from the face of the chuck to the face of the turret. Swing over the ways of the 2H model is 27 in., and it is furnished with an 8 or 10 in. spindle bore. Model 3H has a 29 in. swing over the ways, with 8, 10 or 12 in. spindle bore. The same spindle bore is furnished for the 4H model, which has a 32 in. swing. The Model 5H lathe has a 36 in. swing and is furnished in 2¼, 10¼ and 12¼ in. spindle bore. On the standard 2H, 3H, 4H and 5H models the turning length is 72 in. Extra bed lengths are available in 2, 3, 4, 5 and 6 ft. increments.

Type H fixed gap turret lathe handles large or irregularly shaped parts, and is furnished with fixed gaps 26 to 56 in. long in 6-in. increments. The 3H machine is designed to swing 42 in. diameter, the 4H swings 45½ in., and the 5H 49 in. diameter.

The Type H sliding bed gap turret lathe is adaptable to the machining of parts having angular extensions or those which are non-symmetrical in shape. The sliding bed provides additional swing up to 84 in. To convert the machine to a conventional turret lathe, the gap may be closed. Thus, the use of both square turret and hexagon turret tools is permitted.

Designed to swing 150 in. through the gap, the special sliding bed gap turret lathe handles the machining of landing struts for airplanes. The bed is mounted on a concrete foundation in a pit below the floor level and swings 32 in. over the carriage and 34 in. over the bed ways. The maximum distance from the face of the chuck to that of the turret is 144 in. with the gap closed, or 185 in. with the gap open. This machine is equipped with a 40 hp. motor.

Large parts and special work can be handled on a production basis with the Libby heavy-duty turret lathe with a 17¼ in. spindle bore. Swing over the bed ways of this machine is 41 in. and 37½ in. over the cross-slide. Maximum distance from the face of the chuck to the face of the turret is 12 ft. This lathe is also powered by a 40 hp. motor.

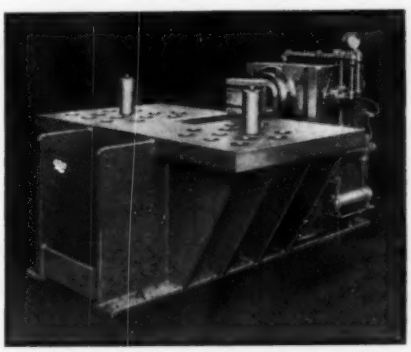
Eight spindle speeds are available in the headstock transmission of the Type H machines, with speed selection controlled by three levers. Sixteen spindle speeds are obtainable with a two-speed motor. One lever divides the eight speeds into two groups, four high and four low, which in turn are divided into two groups of two speeds by another lever. The third lever, located at the front of the headstock, selects the particular range desired.

Feeds in the apron are rapid traverse and independent of each other. Eight reversible feeds are provided in the apron for each of the nine positions of the lever on the selective gear box, providing feeds for cutting all standard threads including 7½ and 11½. A feed range of 0.0019 to 0.125 in. may be furnished. The aprons are completely inclosed with all gears running in oil. Feed changes are obtained by rotating the dial on the lower left side of the apron and by shifting the clutch lever to the left or right for coarse or fine feed. Longitudinal power feed is obtained by locking the handwheel, causing the leadscrew nut to revolve about the stationary leadscrew.

Cross feed operates through a friction clutch and is engaged by a lever on the apron. Adjustable stops are provided for automatically disengaging the feed for duplicating dimensions. Power rapid traverse for longitudinal movement of the carriage in either direction is obtained by rotating the leadscrew in the apron nut. The leadscrew permits the use of taps, dieheads, multiple thread chasers, or single point tools for cutting threads from 2 to 128 inclusive. An indicator dial is provided for threading blind holes.

Beatty Hydraulic Bender For Forming Welded Shapes

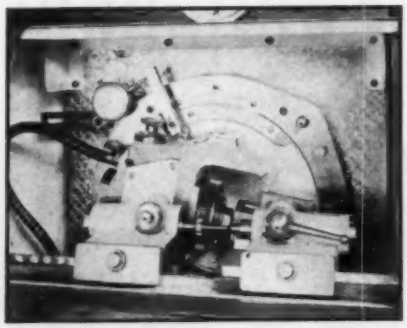
For pipe bending, straightening, pressing and miscellaneous forming of light structural and welded shapes, Beatty Machine & Manufacturing Co., Hammond, Ind., has developed a hydraulic bender which is built in capacities from



35 to 200 tons. This equipment has a pressing speed of 40 in. per min. and return speed of 130 in. per min. It has a maximum operating pressure of 2,000 lb. per sq. in.

The ram measures 12×9 in. high and is provided with T-slots for mounting dies. The table is 42×72 in., and is provided with 26 holes for location of 4 in. diameter bending pins in various positions to facilitate bending and straightening of odd shapes. Pressing speed is 40 in. per min.

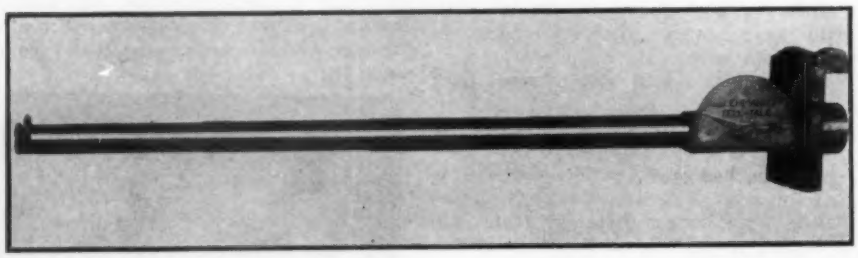
Fellows No. 4 Gear Shaving Machine Holds Small Fine-Pitch Gears Between Fixed Centers



Small fine-pitch gears up to 4 in. PD, 20 DP, and 1 in. face width are shaved on the No. 4 machine recently placed on the market by the Fellows Gear Shaper Co., Springfield, Vt. To maintain concentricity the work is held on fixed centers located in adjustable head and tail stocks. The work slide instead of the shaving tool is reciprocated by a crank mechanism which slowly traverses the work across the shaving tool. The worktable is adjustably mounted on this slide so that it can be set for correct taper.

The cutter head is adjustable for crossed axes setting, having a maximum angular movement of 20 deg. both sides of center. Accurate means are available for setting the tool relative to the work, a dial graduated in 0.0005 in. being available. Once the machine is set, of course, the proper depth is maintained by means of a depth feed cam.

The tool spindle is driven by a motor mounted in the feed slide. The work slide motor also operates the compound pump and is provided with a plugging switch to prevent coasting of the slide.



Tell-Tale Deep Hole Indicator Serves General-Purpose Use

Lehmann Machine Co., Chouteau & Grand Blvd., St. Louis 3, Mo., has a tell-tale indicator suited for general-purpose hole inspection. This Tell-Tale unit was originally developed for operations on gun lathes and has been used largely on 75 mm., 3 in. and 90 mm. gun tubes. The indicator has been made up to 110 in. long for holes 3 in. in diameter or larger, but can be furnished in a greater range of sizes. Illustrated is a unit which has been adapted to mount on a hexagon turret face, but other mounts can be furnished to meet requirements.

The wheel on the end of the indicator contacts the upper wall of the hole when the unit is inserted into the work. Work is revolved slowly and the run-out is indicated in thousandths of an inch on the dial. Two adjustably mounted indicators are provided. One may be set for a plus or minus reading, and the other for the total run-out.

Worthington V-Belt Sheave Features Quick Detachment

The QD (quick detachable) V-belt drive sheave is being manufactured by Worthington Pump & Machinery Corp., Harrison, N. J., in standardized dimensions, with a maximum of ten grooves available.

To mount the driver sheave, the keyway of the tapered split hub is lined up with the keyway of the shaft and the key placed in position. The hub is then slipped on the shaft and the cap screw is tightened. The sheave rim is slipped on the tapered hub, aligning the drilled holes with the tapped holes in the flange of the hub. The pull-up bolts are inserted in the holes and tightened. To remove the sheave the pull-up bolts are backed out and screwed into the tapped holes

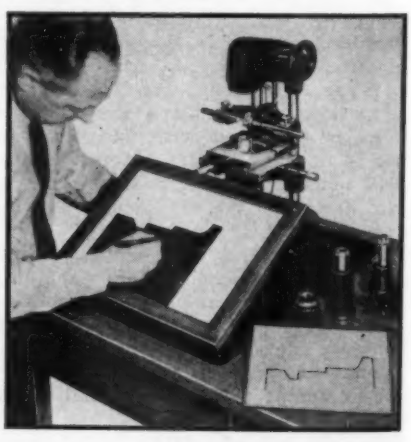
in the rim, using them as jackscrews to break the tapered friction fit.

The driven sheave is mounted and removed in much the same manner as the driver. A chain hoist is used to raise the sheave rim into position on the tapered hub.

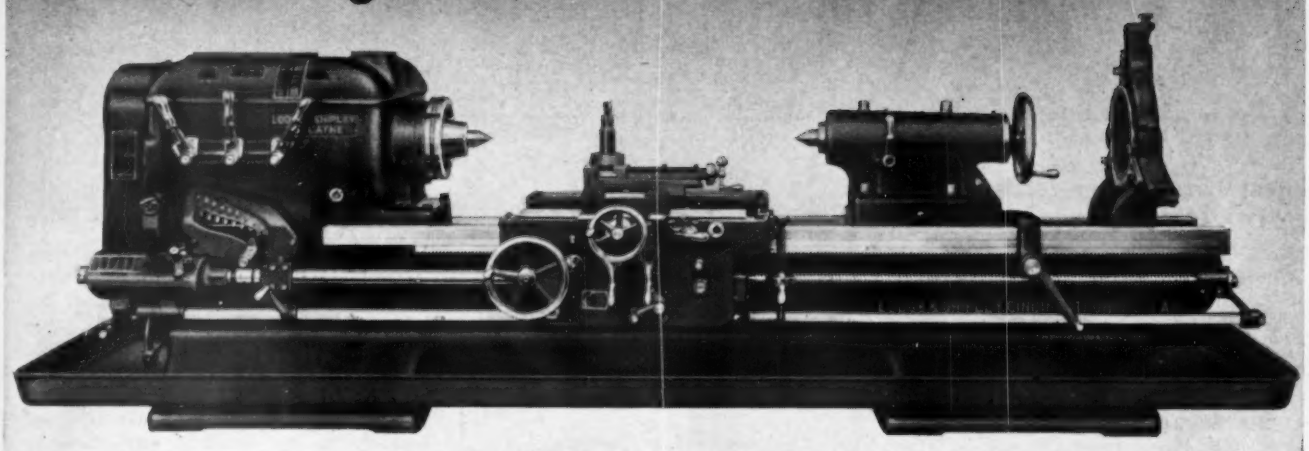
Scherr Makes Wilder Projector With 2-In. Diameter Condenser

The Wilder projector with a 2-in. diameter condenser has been developed by George Scherr Co., 128 Lafayette St., New York 13, N. Y. The 10X lens is 1⅝ in. in diameter and the 20X lens is 13/16 in. Installation of a larger condenser permits the use of larger lens in the low-power series.

The projector has a fully inclosed head with a streamlined and ventilated lamp house. Spiral gears are used in the focussing motion. The lenses are set in large, heavy mounts, which facilitates changing and proper positioning in the lens cone.



TOMORROW'S LATHE ... TODAY!



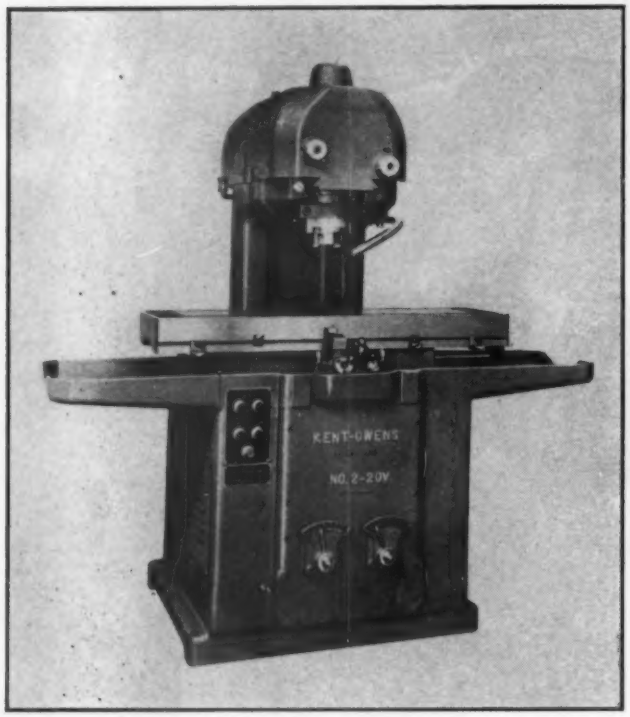
INCORPORATING every feature necessary for easy and profitable operation, the Lodge & Shipley 25" and 27" Selective Head Lathes are powerful, heavy duty machines which reflect in every detail the experience gained over many years of specialized manufacture of lathes. Whether the job be one requiring unusually close limits of accuracy or one where speedy removal of metal is necessary by heavy hogging cuts, these lathes provide an ease of operation which permits the operator to do far more and better work with less expenditure of effort.

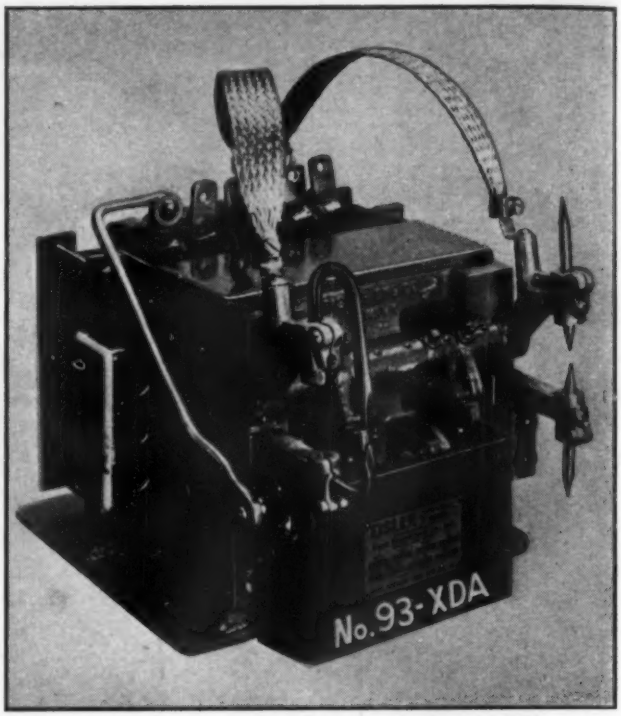
Write for detailed information.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES





Kent-Owens Miller Permits Two Table Operations at a Time

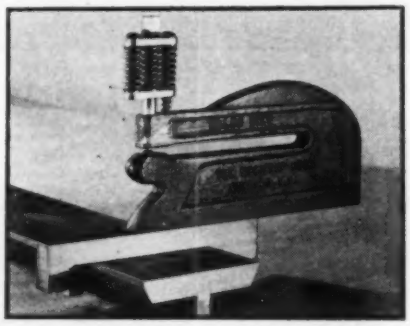
Kent-Owens Machine Co., Toledo, Ohio, announces the Model 2-20V vertical milling machine. This machine permits independent adjustment of the feed rate for opposite directions of table travel. Thus, one operation can be performed at one end of the table and a different operation at the other end. The table is 42×12 in., and has a 20-in. travel, with a fully automatic cycle. Each direction of table travel has a separate feed rate control dial which may be adjusted independently of the other. The table can be fed or rapid traversed in either direction, automatically shifted from rapid traverse to feed in either direction, and automatically reversed at both ends of the stroke. Also, it may be automatically stopped at any desired point in its travel.

Three different column heights are available, permitting the minimum gap from the table surface to the spindle nose for maximum rigidity. The base machine has a maximum gap of 10 in., but maximum gaps of 12 or 14 in. are available, each having 4-in. vertical quill adjustment.

Wide face spline-mounted pick-off gears on the head provide spindle speeds ranging from 64 to 860 r.p.m. Either a low range of 32 to 428 r.p.m. or a high range of 96 to 1,248 r.p.m. can be provided.

Wales Hole Punching Units For Presses and Press Brakes

Type AA hole punching units have been brought out by Wales-Strippit Corp., North Tonawanda, N. Y. Either a three spring stripping guide assembly for punching metal up to ⅛ in. thick or a single spring stripping guide assembly for metals up to 0.076 in. thick can be provided. Both guides are interchangeable with the standard stripping guide assemblies of the Type C hole punching units. These AA hole



punching units can be used on press brakes and stamping presses to punch unlimited straight line, staggered and scattered hole punching patterns in metal sheets.

On press brakes, these units are mounted to adapters which are clamped to the press brake rail. Two styles of adapters are available. One is arranged for straight line hole patterns and the other is adjustable front to back for staggered and straight line hole punching. On stamping presses, these units are mounted directly to a templet.

Each unit is independent and self-contained. The punch and die are held in constant alignment by a holder. The punches and dies are interchangeable to punch various sizes and shapes with the same holders. This line of hole punching units features die-setting time of minutes instead of hours and eliminates adjustments.

Eisler Spot Welding Machine For Light Gage Sheet and Wire

Welding of light gage sheet and wire can be handled on the duplex-jaw spot welding machine made by Eisler Engineering Co., Newark, N. J., One model can be furnished with a rocker arm and another with a vertical press arrangement. Both models are foot operated by means of two treadles and chains and made in sizes from ½ to 3 kva. The machines are built for single-phase, 110, 220 or 440 volts a.c., 25 to 40, 50 and 60 cycles.

These bench type machines consist of two independent small welding machines built together with one transformer and a rheostat for finer heat adjustment. The transformer has five secondary tap connections, providing five different heat positions.

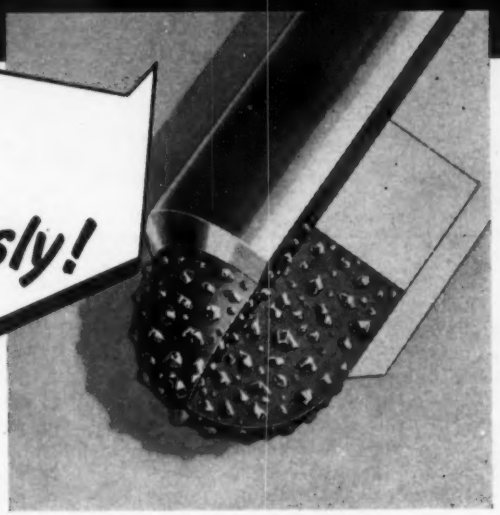
The operating jaws are brought together by stepping on the treadle. Contact is made by further pressing on the treadle, whereupon high welding current flows from the secondary through the work until the switch automatically breaks the circuit.

Characteristics of Emeloid Plastic Can Be Modified

A plastic known as Emeloid, in which hardness, softness, elasticity, toughness and freedom from magnetic attraction can be varied to meet requirements, has been developed by the Emeloid Co., 287 Laurel Ave., Arlington, N. J. Available in clear or color, Emeloid can be formed, molded, shaped, cut, sheared, sawed, punched, pierced, stamped, polished, drilled, machined, lithographed and printed. It is light in weight and obtainable in several grades.

Do the Diamonds in *Your* Dressers Go A·W·O·L?

The Diamonds in *these* Dressers Stay on the Job *Continuously!*



THE cemented carbide matrix in diamond-impregnated carbide dressers is moulded to the exact contour of the diamonds. Low coefficient of expansion and contraction insures permanent settings. No chance of loosening through heat expansion, as in ordinary dressers.

Carboloy Cemented Carbide Diamond Impregnated Dressers—made of the same guaranteed quality as Carboloy tools—give you this outstanding advantage plus many other benefits welcome under today's rush conditions.

You eliminate all remountings—get uniform results—receive maximum use from every precious particle of diamond—pay a uniform, non-fluctuating price—and save at least 25% annually on dresser cost. For all types of grinding wheels. Write for folder DR-100.

Quarter section of the Carboloy Dresser shown above. Fits all standard holders. No remountings necessary. To get a new cutting surface, simply give dresser a ¼ turn in holder. Long periods of continuous service. 2 minutes to "recondition" when required at infrequent intervals.

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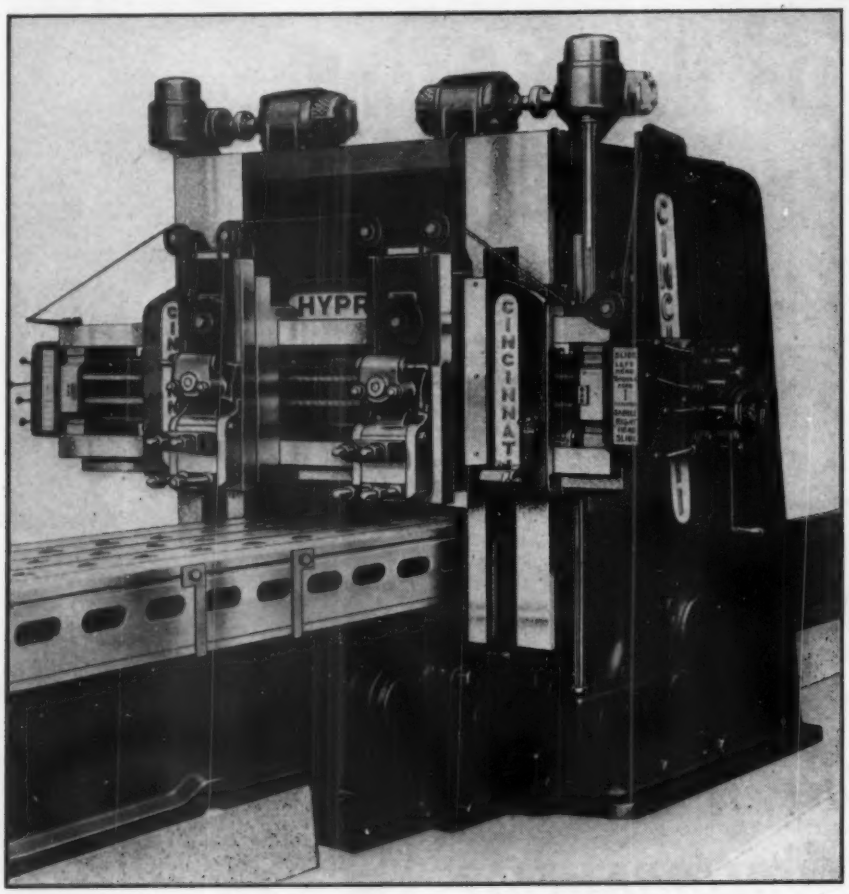
Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND IMPREGNATED DRESSERS

For GENERAL USE ON GRINDING WHEELS

Cincinnati Planer Offers an Improved Machine For Heaviest Cuts on Railroad Frogs and Switches



The Cincinnati Planer Co., Cincinnati, Ohio, announces development of an improved "Hypro" frog and switch planer designed for maximum rigidity in withstanding the heaviest cuts. Other features that have been stressed in the design are weight, speed, accuracy, convenience, and safety to the operator.

The machine has a double length inclosed bed with extra deep housing cheek bearing. A full-length box-section arch adds to the rigidity of the housings. A wider V spread is provided to the bed and table, and the latter is of greater depth and has full length hold-down gibs.

The combination herringbone balanced drive is built to transmit 100 hp. All shafts are of large diameter and run in hardened, ground and lapped journals. Gears are steel and hardened. Heavy-walled bronze bushings are used throughout the drive train. Tool blocks, clapper boxes and clamps are of steel. A self-locking worm is used to swivel the clapper box.

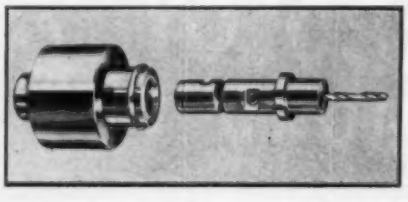
The rail and down-feed screws are of extra large diameter. A long bronze nut is mounted near the top of the slide and is accessible for taking up backlash. Counterbalanced, inverted dovetail slides prevent dropping of the slide and consequent hammering of the screw in the nut as the tool strikes the cut at high speed.

The rail heads are mounted on a square-gibbed crossrail. A feed and traverse unit is of the sealed type with hardened gears and clutches. All shafts are mounted in anti-friction bearings running in oil.

Instantaneous rail lift is optional equipment. Heads and slides can be fed and traversed in any direction, independently or together. There is a special jogging device for feeding the tool into the work for tapering and trimming as the table moves in the cut direction. Both heads may be moved with a single crank in either the same or opposite directions simultaneously.

Wright Chuck Runs While Tool Changes Are Made

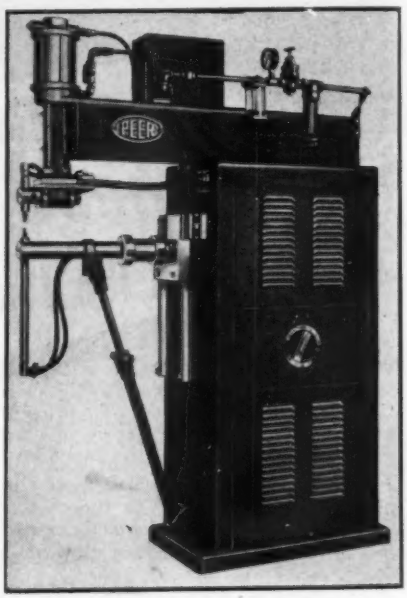
Tools can be changed in three seconds while the Centrif-O-Matic high-speed drill chuck is operating. Made by the R. M. Wright Co., Washington Square Bldg., Royal Oak, Mich., the chuck has an outer sleeve which is slid back to release a centrifugal lock and permit the tool and its adapter to be removed. A new tool is then inserted and the sleeve snapped back to position, locking the tool centrifugally. Drill adapters are available for the Centrif-O-Matic chuck to accommodate drill sizes from 1/16 to 9/32 in., letter drills from A to K, and wire drills from 1 to 60.



Pier Spot Welder Operates At 110 Strokes Per Minute

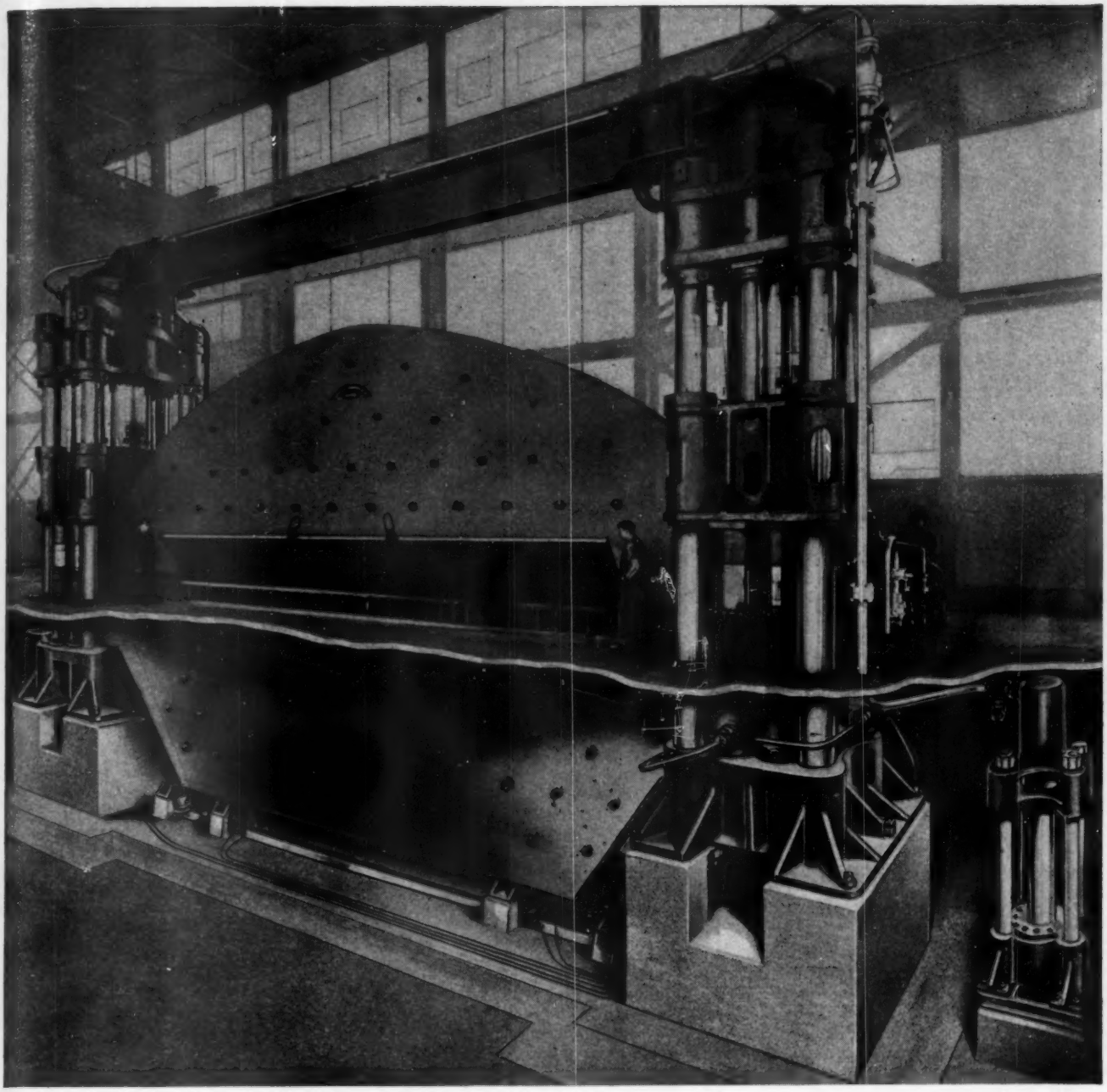
Series P-20 spot welders, developed by the Pier Equipment Manufacturing Co., Benton Harbor, Mich., are fully automatic with respect to control of pressure, speed, weld time, hold time and off time, and are capable of being operated at speeds up to 110 strokes per min.

The upper electrode is actuated by a double-acting air cylinder, mounted on a quill housing. Electrode pressure range, depending upon throat depth and cylinder size, is from 400 to 800 lb. A 4 in. cylinder equipment on the 12 in. throat welders and a 3 in. cylinder is standard equipment on the 24 in. throat machines. Pressures are adjusted by a regulating valve provided as standard equipment. These welders are designed for a maximum stroke of 3 in. and may be operated within a range of 0 to 3 in. maximum.



Current regulation is provided by eight steps through an auxiliary auto transformer mounted below the welding transformer. Current may be adjusted from 50 percent of maximum to 100 percent through the eight-point selector switch located on the right-hand side of the machine.

Series P-20 welders are built in two capacities, 20 and 30 kva. A NEMA type 3-B weld timer is recommended.



SIX THOUSAND TONS

This Southwark press is probably the largest of its type in the World—a Six Thousand-ton Bending press—built by Southwark craftsmen to specifications calling for unusual design and construction. The performance of this press has met the full expectation of the owner in every respect.

Difficult assignments are not new to Southwark and are accepted with mature appreciation of all the requirements needed to achieve desired results. In addition, Southwark is manned and equipped to support this capacity.

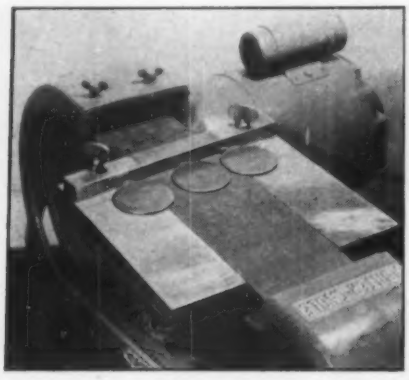
If you have, or anticipate, a problem in your shops involving press equipment of ordinary or radical design and specification, call in our Southwark specialists.

Baldwin Southwark Division, The Baldwin Locomotive Works, Philadelphia; Pacific Coast Representative, The Pelton Water Wheel Co., San Francisco.

BLW THE BALDWIN GROUP

BALDWIN SOUTHWARK

Division **THE BALDWIN LOCOMOTIVE WORKS,** *Philadelphia, Pa.*



Porter-Cable Feed Table For Surfacing Small Parts

For surfacing disks, squares and other small parts, Porter-Cable Machine Co., Syracuse 8, N. Y., has produced the in-out feed table for use with its G-4 belt type grinder. The accessory consists of two tables that provide a flat plane for feeding the stock and receiving it from the belt. One table is located at each side of the belt, and both are adjustable to the grit level.

In addition, an adjustable rail holds the stock against the pressure of the belt. The rail can be set at the correct angle to control the amount of grinding within close tolerances.

Attached to a wet belt grinder, the table is dustless and protects against burned or abraded hands. For semi-automatic operation, the table can be equipped with hopper and in-feed and out-feed chutes.

Holden Heat-Treating Unit Provides Three Baths for Tools

Preheating, hardening and quenching of high speed tools can be performed with the Type 230 heat treating unit brought out by A. F. Holden Co., New Haven, Conn. The unit consists of three pots, with pots one and three removable and interchangeable, permitting several different baths to be used in the same furnace unit.

For preheating high speed tools, for heating water and oil hardening steels, alloy steels and for carburizing and silver soldering, pot one provides temperature range of 1,400 to 1,800 F.

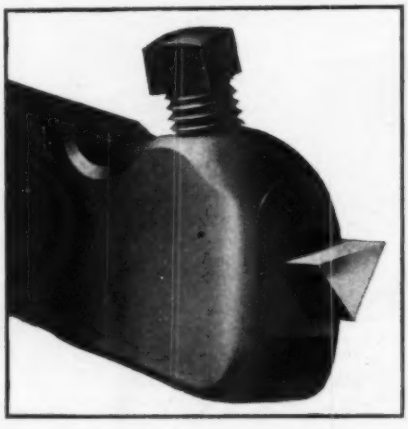
Pot two for hardening all types of high speed steels, for copper brazing and for heating forgings, provides a temperature range of 1,900 to 2,350 F.

The third pot is used for quenching high speed tools from the hardening temperatures, for tempering, nitriding, bluing and descaling forgings and similar parts, and provides a temperature range of 1,000 to 1,400 F.

Uniformity of hardness and heating on thin or heavy sections is provided with this heating unit, and less time is required for finishing with savings in time for subsequent finishing operations. Several types of tools such as hobs, form tools and taps can be hardened to size without refinishing.

Bits for Triangle Toolholders Need Only One Flat Grind

Lathe toolholders that mount triangular-shaped toolbits are being produced by Triangle Tool Co., 2106 East 22 St., Cleveland, Ohio. The chro-



mium-plated toolbit is held in the toolholder by means of a triangular seat and conventional setscrew. It is said that this combination eliminates vibration and tool chatter in the holder, permitting increased machine speeds and reducing tool wear. The triangular design permits both large and small toolbits to be used in the same holder without special shims or wedges. One flat grind across the face of the triangular bit maintains correct and accurate rake and clearance angles. Right- or left-hand cutting can be performed with the same bit without additional grinding. The same cutter, turned end-for-end, requires no extra adjustment for square cutting operations.

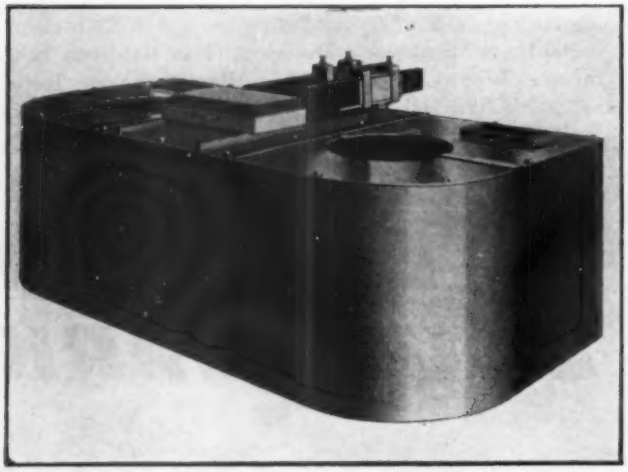
Four grades of high speed tool steel bits and three standard model toolholders are available.

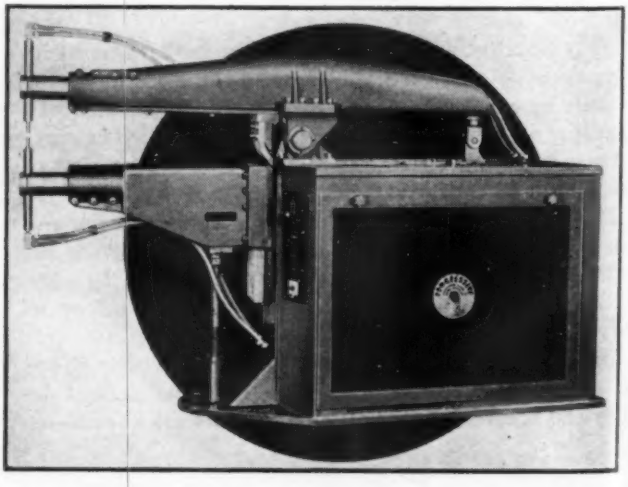
Progressive Rocker Arm Welder Equipped to Hold Flanged Work

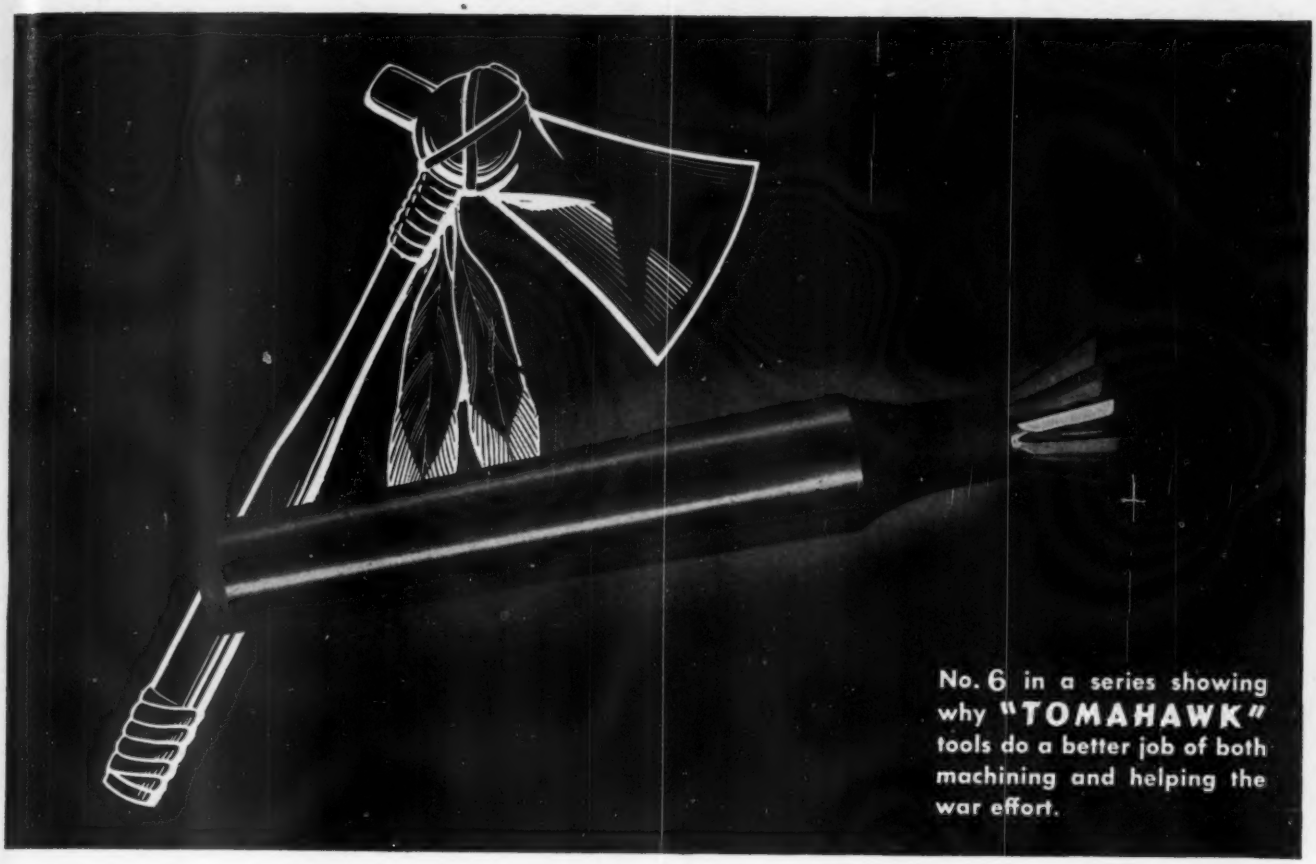
An improved rocker arm welder for condensor-discharge welding of aluminum sheet has been developed by Progressive Welder Co., Detroit 12, Mich. This Model B machine handles any combination of two thicknesses of 24-ST Alclad, between 0.016 and 0.081 in., at an over-all production rate between 1,000 and 2,000 spots per hr. Adjustable throat depth of this welder is from 36 to 42 in. A retractable upper arm permits insertion of flanged work. This retraction is accomplished through a separate air cylinder controlled by an auxiliary foot switch. If desired, refrigerated electrodes may be used in this machine.

Both upper and lower arms are of the universal type, and are 3½ in. in diameter. The lower knee with its arm is vertically adjustable over a range of 10 in. To reduce voltage drop to a minimum, the welding arms are made of hard drawn copper and current-conducting castings of high-conductivity bronze.

To hold the points together while dressing, solenoid valves permit the application of a light preset air pressure to the operating cylinder. Provision is made on the front of the machine for mounting of control panels. Treadle controls require light pressure to operate. Pancake type transformers are provided with a tap switch which permits the selection of several turn ratios on the transformer. While the transformers are rated for a maximum of 3,000 volts of capacitor charge, they are tested to 6,000 volts.







Trade "TOMAHAWKS" had wooden handles

Now many **"TOMAHAWKS"** like this end mill from Genesee have 'handles' of machine steel, butt-welded to the high speed steel cutting end.

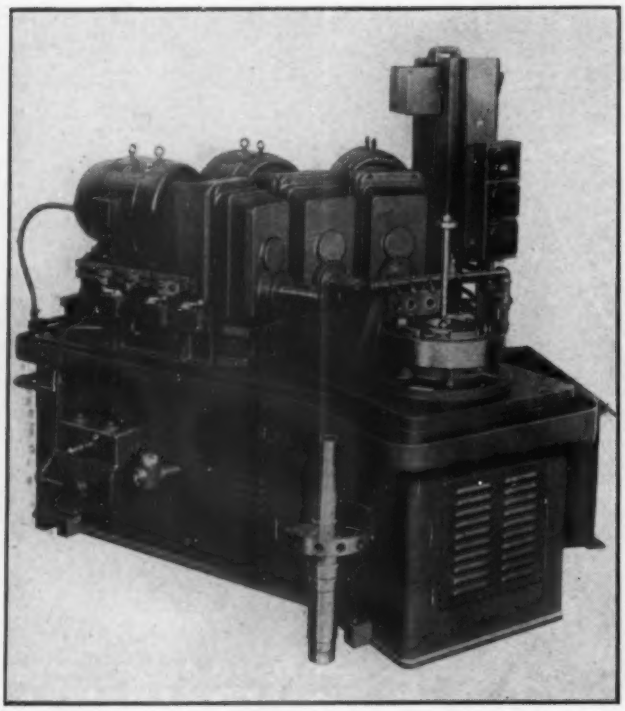
In addition to conserving precious H.S.S., and simplifying production, the soft steel 'handle' improves the tool, since it provides hardness where hardness is needed (at the working end) and toughness and resilience where those are essential (in the shank).

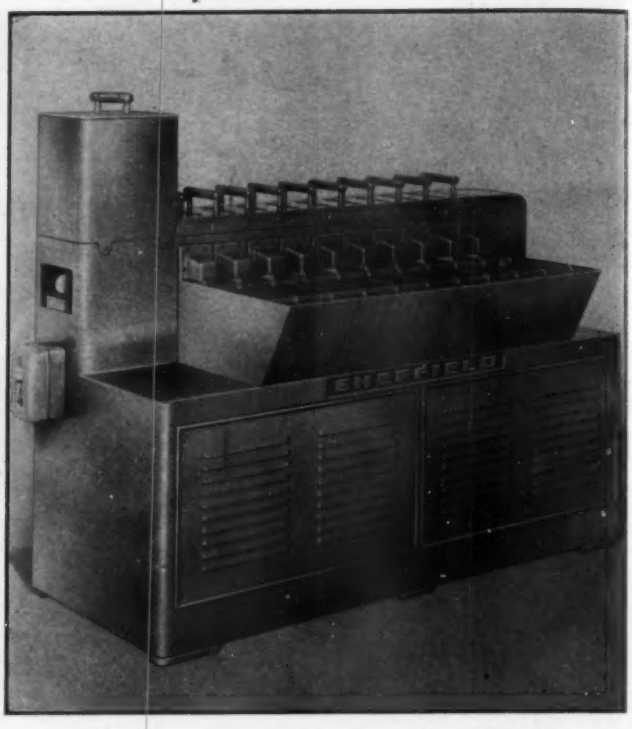
FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

GENESEE TOOL COMPANY

FENTON, MICHIGAN

Registered Trade Mark





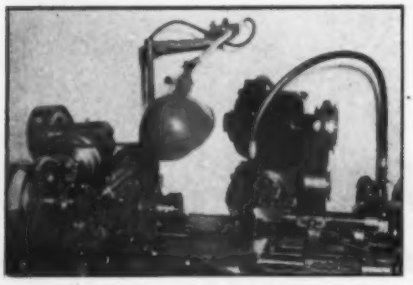
Propeller Shaft Drilled On Snyder Automatic Unit

Fifteen holes equally spaced around an extended pan on a forged aircraft propeller shaft are drilled on an automatic cycle machine built by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, Mich. The machine is a horizontal, three-way hydraulically operated drilling machine with three drillheads, each with individual hydraulic feed cylinder. The three heads are geared together for single electrical control.

Operation is automatic and continuous until all 15 holes have been drilled. Index mechanism is electrically synchronized and after five indexes, the machine stops for unloading and reloading. Hydraulic equipment is housed in the welded steel base and coolant is contained in a separate tank and trough at the side of the machine.

Waltham Makes Lamp Fixture To Fit Its Thread Miller

An adjustable lamp fixture has been made by Waltham Machine Works, Waltham, Mass., to fit its thread miller. The unit can be applied to the belt-driven machine as well as to the three-motor drive machine, using the instructions furnished.

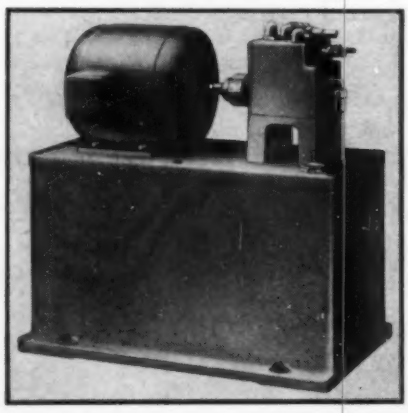


The arms are adjustable and the reflector can be moved to any part of the machine. An extension wire and plug are furnished.

Anker-Holth Supercharged Pump Provides High and Low Pressure

A supercharged combination high and low pressure oil hydraulic power unit called the Hi-Po is being placed on the market by Anker-Holth Manufacturing Co., 332 South Michigan Ave., Chicago, Ill. The unit develops pressure in the 3,000 lb. range.

A ½ hp. motor, using a supercharger to preload the piston chamber, delivers 3,000 lb. line pressure. SAE 20 motor oil is used as the pressure medium. The pump and motor are mounted directly on the oil reservoir. A low pressure by-pass control, with a range up to 300 lb., is built into the pump body. Both high and low pressure can be controlled individually on the power lines.



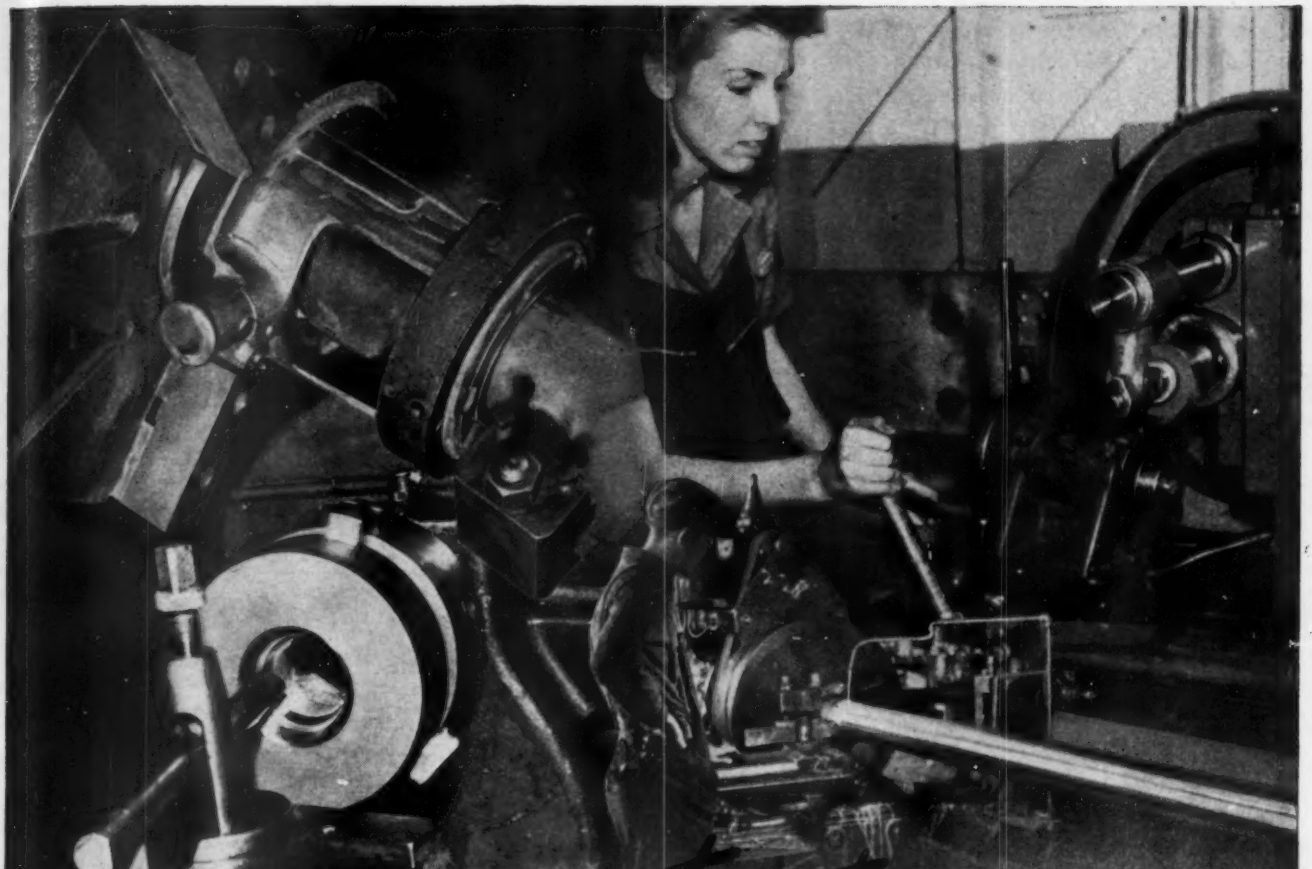
Balls Are Rapidly Sorted By a Sheffield Machine

To overcome an important bottleneck, the Sheffield Corp., Dayton, Ohio, built a precision inspection machine for ball bearings for one of the country's largest ball bearing manufacturers. This machine checks and sorts ball bearings ranging from ⅛ to 11/16 in. in diameter, at the rate of 15,000 to 20,000 an hour. This figure was formerly considered a full day's quota.

The machine checks and sorts ball bearings into ten classifications in one operation, while equipment formerly in use could check but one size at a time. Balls are placed in the hopper and a walking beam lifts them to position a few inches away. If the balls are of the same size as an opening with exactly parallel sides, they fall through and are retained in a compartment below. The first step eliminates all undersize balls.

Those which remain on top of the opening are moved to the next stage where the aperture is slightly larger. Balls which do not drop through are then carried along to the next aperture, and this process continues until either the balls drop into one of the divisions or are too large to pass inspection and fall into the last compartment.

The machine can be set to segregate balls in ten classifications, first those that are undersize, then eight successive steps, say 0.00005 in. larger than the preceding size, and the tenth station for oversize balls. Master blocks having Carboloy inserts are used for the progressive steps. Dimensions of the inspection steps can be regulated by changing the size of the opening between the parallel sides. The operator need only keep the hopper on the inspection machine filled.



KENNAMETAL—the *fastest* cutting tool in the steel-machining industry

Style 12

The introduction of KENNAMETAL steel-cutting carbide tools in 1938 has proved to be one of the major contributions to today's enormous production of machined steel parts. KENNAMETAL has increased plant output by consistently reducing floor to floor time on all steel-cutting jobs.

One customer writes us, "We have done jobs here with Kennametal, that otherwise we would have to pass up. . . . The ordinary tool just will not touch this type of material, the edge turns over at once. We are for Kennametal 100%."

Because of its great strength and hardness, and superior wear-resistance qualities, KENNAMETAL can efficiently face, bore, turn, or mill any job with a 30 to 50% saving in time over other cutting tools. KENNAMETAL reduces the number of cuts required by permitting the use of heavier feeds and high peripheral speeds. KENNAMETAL also roughs and finishes in one cut on many operations.

To increase your production of machined-steel parts use KENNAMETAL—the tool of greater output per man hour; the tool that cuts more steel in less time.

Write for your copy of the KENNAMETAL Catalog 43B. It contains information on the care and use of KENNAMETAL carbide tools and blanks.

KENNAMETAL *Inc.*

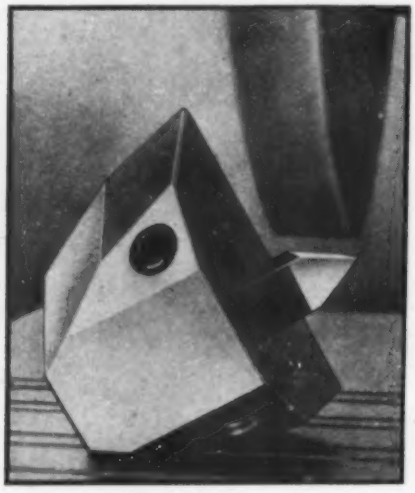
103 LLOYD AVE., LATROBE, PA.

Trade Mark Reg. U. S. Pat. Off.

Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)

Clark Thread Grinding Fixture Adaptable for Magnetic Chuck

Robert H. Clark Co., 3424 Sunset Blvd, Los Angeles 26, Calif., is manufacturing a thread tool grinding fixture for precision grinding 60- and 29-deg. threading toolbits. The design of the fixture makes it adaptable for use on a magnetic chuck, although it may be clamped to the work table. The toolbit holders hold round or square tool-



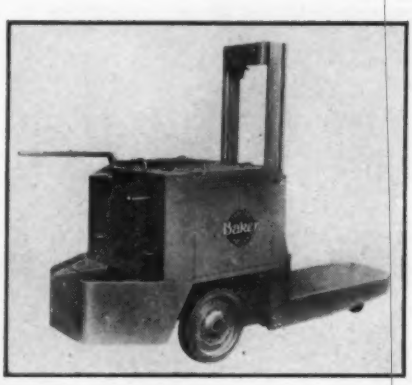
bits from ⅛ to ⅝ in. for cutting both right- and left-hand threads. One model is made for the mechanic's tool kit, and another is suited for heavy-duty work.

The bit slides into the holder and is tightened by a setscrew. The fixture is placed on the grinder work table and positioned for the thread angle desired as indicated on the fixture. This automatically holds the bit at the desired angle to the grinding wheel and eliminates guess work.

Baker-Raulang Hy-Lift Truck For Loading and Tiering

A companion truck to the Type E-2 is the 4,000-lb. capacity Type H-2 Hy-Lift truck made by Baker-Raulang Co., Baker Industrial Truck Div., 2168 West 25 St., Cleveland, Ohio. This Hy-Lift truck can be used interchangeably in the same material handling system with the Type E-2 unit. It combines the self-loading feature with tiering and is useful for transporting and tiering skidded material. The truck is built on a 66 in. wheelbase, with over-all length, including the guard, of 123¾ in., and operates in intersecting aisles 67 in. wide. It is 83 in. high and provides a maximum lift of 67 in. The platform is 26½×54×11 in. high in the low position.

The control lever starts the pump motor and closes the valve forcing oil into the jack cylinder. The same lever is used for lowering by gravity. A limit switch shuts off the pump motor at the upper limit of platform travel, and is provided with auxiliary safety through a relief valve. The

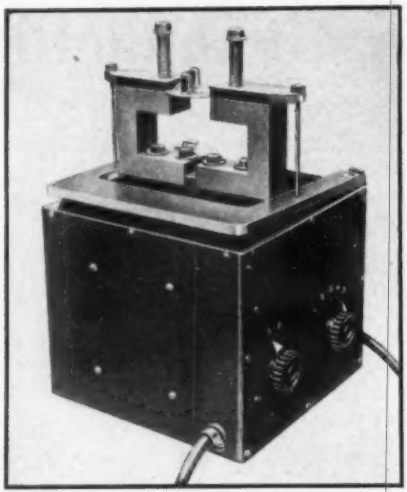


platform travels vertically on ball bearing rollers running in upright channel guides. Power is supplied by a single hydraulic jack and travel is compounded by sprockets and roller chains.

The battery box is 32×39½ in. and provides space for additional battery capacity. The cover on the battery compartment slides and is equipped with handles in place of hand holes. The no-plug controller provides three speeds in each direction controlled by a single handle.

a.c.f. Soldering Transformer Has Five Heat Speeds Available

A soldering transformer, known as Type T-37, is being produced by American Car & Foundry Co., 30 Church St., New York, N. Y. It meas-



ures 9¾×9¾×8¾ in. high. Five heat speeds are available, giving ten heat ranges for the various grades of work. Primary capacity is 4 kva., while the secondary capacity runs from 2 to 0.7 kva. Voltage range is from 0.3 to 0.9.

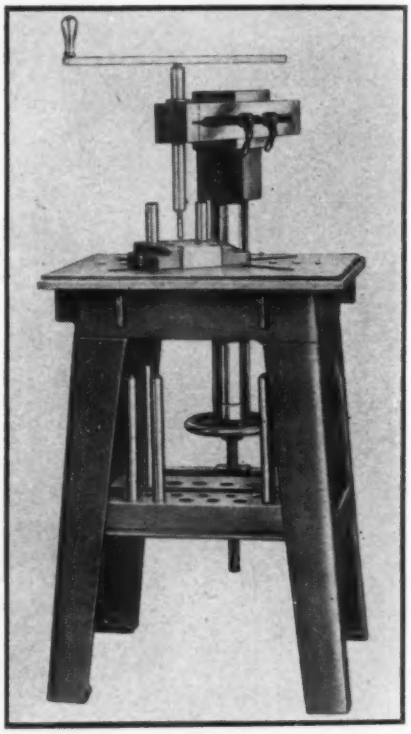
Houghton's Rust Veto 110A Dries to a Hard Thin Film

A light amber-colored liquid applied by brush or spray, Rust Veto 110A is a hard-drying rust preventive that dries to a thin glossy transparent film in 25 to 30 min. The hard film is flexible, however, at temperatures as low as —70 F.

When dry the coating is non-inflammable. Thickness of the film is approximately 0.0003 in., and it adheres well to metal even after being soaked in water for 24 hours. Manufacturer of the rust preventive is E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa.

Producto Hand Tapping Table Has a Pivoting Arm

Holes can be tapped or reamed at any point in the work within the table area of the universal hand tapping machine brought out by Producto Machine Co., Bridgeport, Conn. The sliding arm, measuring 2¾×3×6½ in., is movable longitudinally and radially and locks in any position. Thus, the



spindle carrying the tap can be located in any position for tapping holes in the work.

The table measures 22×18 in., and is drilled and tapped on the center line to permit work to be bolted or clamped to the table. It is also drilled at four places to accommodate a tapered stop pin to locate work without clamping. Four radial slots which project on the center are used for disposing of the chips produced from the tapping operation.

Two sizes of tap spindles can be accommodated in the arm. With the bushed hole only, 1¼ in. spindles are employed to drive taps from 13/16 to 1 in. diameter. By the addition of a slip bushing 1 in. spindles are taken to receive taps from No. 5 to ¾ in. diameter. A single spindle is required for each size of tap. The taps are located in the end of the spindle and

WANT TO PREVENT RUST?

Some technical information of great importance to all interested in anti-corrosion coatings

BACK IN 1932, Quaker made some "rustproofing oils and greases" as did several other concerns in the country. These products were usually mineral products of varied viscosities, some of which contained chromate. They worked pretty well, but just how well no one really knew.

Protecting Aircraft Parts a Serious Problem

Then, one of the large aircraft engine manufacturers got into serious trouble, as precision parts rusted on the production line and finished motors shipped to distant points arrived in a deplorable condition due to severe corrosion.

After a preliminary survey by a Quaker Process Engineer, our research laboratory went on the job. The first thing, obviously, was to set up a method that would accurately and effectively measure the value of a rust preventive coating. Salt sprays had been used in the past but they did not give an accurate measure of what was wanted. Even salt spray tests varied widely.

New Product Developed

So, in 1932 Quaker built one of the first, if not the first, humidity cabinets designed specifically to measure semi-permanent rust preventive coatings of an oil or grease type. For the first time one could accurately compare various "slushing mediums" and measure their value under humid conditions at varying temperatures.

Thus a revolutionary type product was developed and the problem was solved for the aircraft engine manufacturer. A line of Quaker Ferrocotes was born that has a wide acceptance among the aircraft and affiliated industries.

Accurate Measuring Technique

But probably more important, a laboratory technique was developed over the next ten years which has enabled the Quaker organization to develop better and better rust preventives. Today, rust preventives are measured in new type humidity cabinets that maintain a constant flow of moist air at a temperature of 120 deg. Fahr. throughout the cabinet. Thus, test results are reproducible time and time again and are definitely tied in with actual conditions met in the field.

However, preventing rust isn't the only thing that must be measured in a good anti-corrosion coating. Cleanability in solvent or alkali as well as the type of film left on the metal after long standing are of tremendous importance.

"Ideal" Rustproofing

Today, the best type of Quaker Ferrocote gives maximum results when applied at room temperature in a liquid form. The resultant coating is a dry, wax-like film. This does not soak into paper and containers nor run away at high temperatures. It stays where it is put, leaving a rustproofed piece that is really rustproof. It is clean to handle and can be inspected and even "miked" through the film and can be readily removed, if desired.

Quaker Process Engineers are thoroughly trained in the methods and materials necessary to give maximum rustproofing results. Their experience and Quaker Ferrocotes can be admirably applied to precision parts, shells, guns, automotive products or any other metal object.

You may profit considerably by discussing your corrosion problems. There's no obligation. Just write or wire.

QUAKER CHEMICAL PRODUCTS CORP.

CONSHOHOCKEN, PA.

OTHER PLANTS: CHICAGO AND DETROIT—WAREHOUSE STOCKS IN PRINCIPAL INDUSTRIAL CENTERS

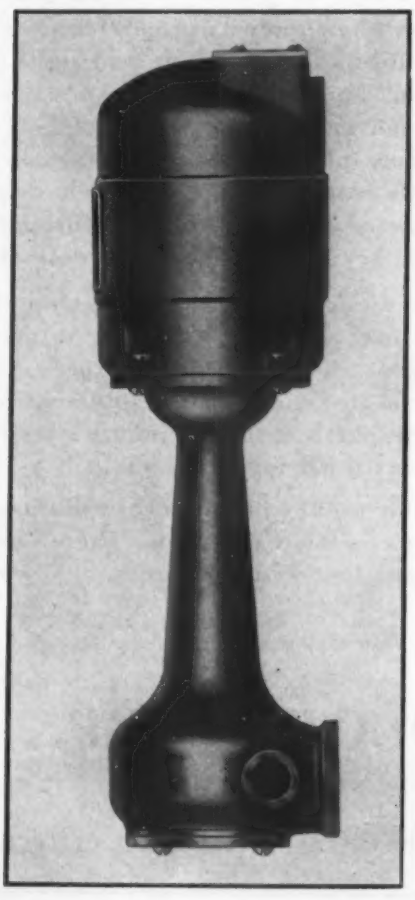
driven by the square, held in position by setscrews. A large driving handle is provided for heavy taps and a small one for machine screw sizes.

The vertical column is adjustable by means of a handwheel and screw and locks by a clamping lever. The maximum distance from the center of the spindle to the column is 17 in., and minimum distance is 3 in. Maximum height from the bottom of the arm to the table is 17 in. and minimum is 8 in. Wooden racks for storing spindles are fitted to the machine underneath the table with taps locked in the spindles.

Pioneer Coolant Pump Suited for Small Machines

A seal-less coolant pump, under 16 in. high, has been developed by Pioneer Pump & Manufacturing Co., 19669 John R, Detroit, Mich. The unit provides coolant flow to small machines such as hand mills, surface grinders, drill presses and tapping machines. The Model MVBD has three outlets, permitting a choice of three piping arrangements, to the right, left, or back into the coolant sump through the intake bracket.

This pump is designed for mounting on the outside of a coolant tank or machine pedestal. It functions with a low water level. The single-phase, heavy-duty motor, integral with the pump body, has totally inclosed ball bearings.



Ferracute Model No. FO2 Press Handles Various Light Jobs

Forming, cutting, piercing, riveting, stamping and other light operations are handled on the Model FO2 foot-operated press, designed by the Ferracute Machine Co., Bridgeton, N. J. This machine is offered as a bench or pedestal type. A kick of the pendulum lever operates the ram, and the

weight of the lever returns the ram to the initial position.

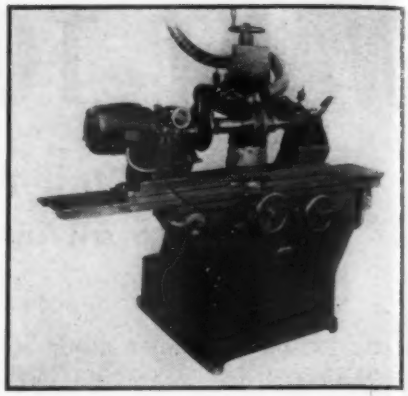
Specifications of the Model FO2 press are as follows: Pressure near bottom of stroke, 2 tons; stroke, 0 to 1½ in.; throat depth, center of ram to back of frame, 4½ in.; hole through bed, 3 in. diameter; height, bed to ram, top of stroke and adjustment, 5½ in.; diameter of bed, 8½ in.; weight of bench press, 200 lb.; weight when pedestal is mounted, 300 lb.

Yoder Roll Grinding Machine Has Stepless Speed Range

A Model 100 roll grinding machine is being made by Yoder Co., 5500 Walworth Ave., Cleveland 2, Ohio. The machine has a maximum capacity of 16 in. diameter and a maximum length of 20 in. between centers. It has a two-speed table travel, giving 3 and ¼ in. travel per revolution of the handwheel.

The spindle is adjustable vertically on the column by a handwheel and screw with a micrometer dial. Spindle drive motor is 1 hp. The column can be rotated 360 deg. Calibrations cover 180 deg. of rotation.

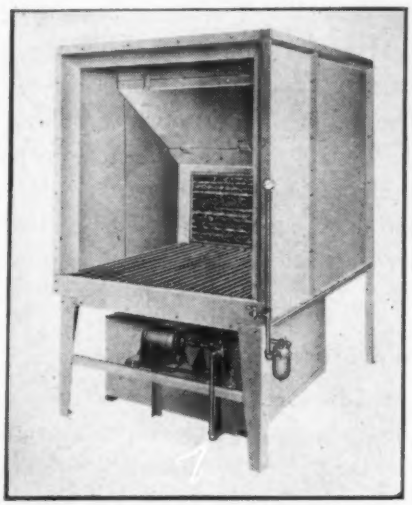
This grinder has a stepless range of



speeds on the headstock from 106 to 933 r.p.m. The work table, which is calibrated in the center portion, may be turned on a 45 deg. angle in either direction for angle grinding.

DeVilbiss Degreasing Booth Made in Sizes to Fit Needs

A spray degreasing booth in sizes varying according to the requirements of the products to be handled has been brought out by DeVilbiss Co., Toledo,

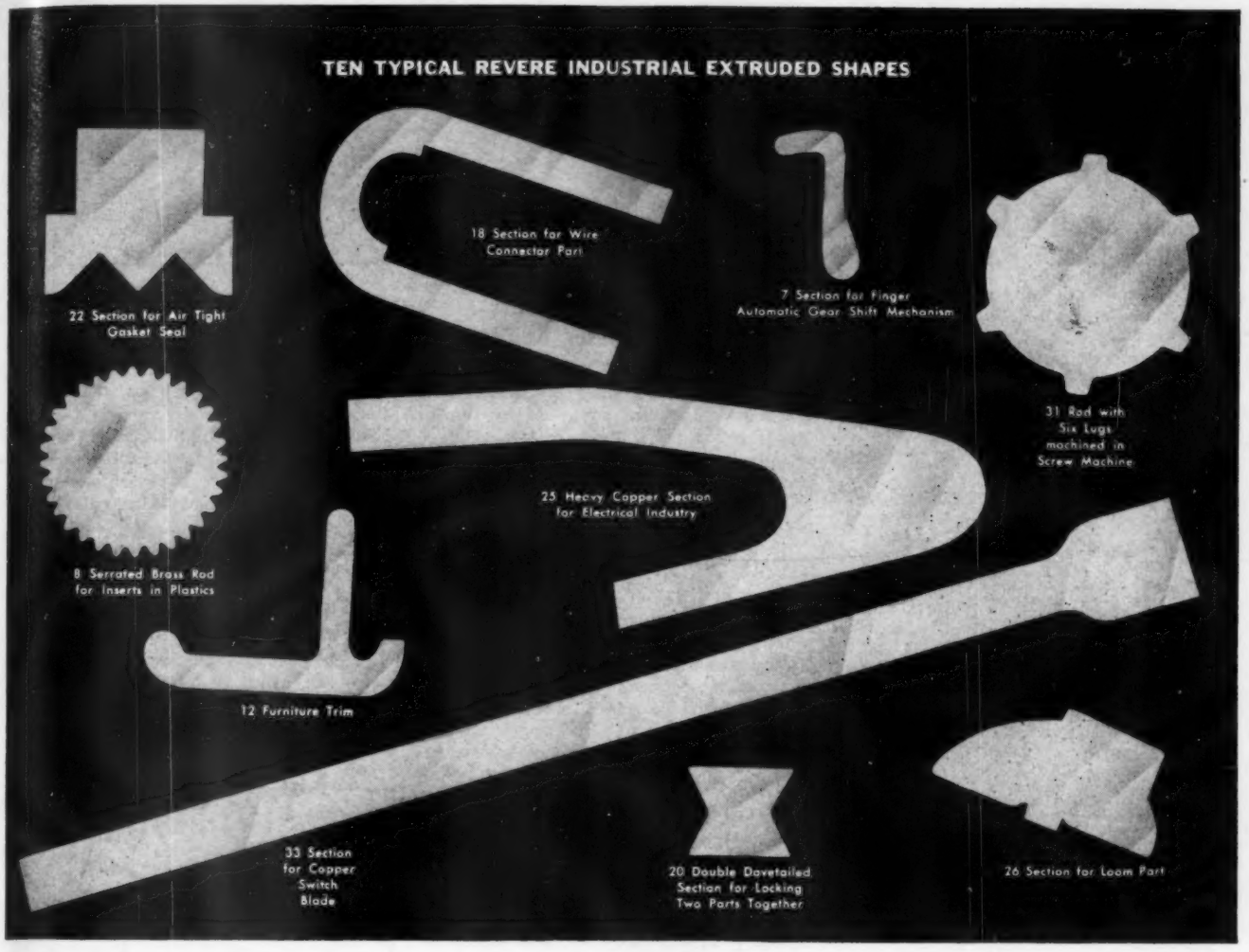


Ohio. The booth is made in 14, 16 and 18 gage steel. Engineered for safe operation with hazardous materials of high volatility and low flash point, the unit removes fumes thoroughly, delivers a hard-driving solvent spray. Solvent loss is held to a minimum, an essential because of shortages.

Insl-X Protective Coatings Are Made for Two Purposes

Protective coatings which air dry in 15 min., and which can be stripped by hand without solvents, are being manufactured by the Insl-X Co., 857 Meeker Ave., Brooklyn, N. Y. It is said the use of these products eliminate greasing or complicated packing methods for machined parts. The coating strips cleanly from the work.

Applied by brush or dipping, the compounds cover properly on all finishes from rough to smooth, and on


TEN TYPICAL REVERE INDUSTRIAL EXTRUDED SHAPES
22 Section for Air Tight Gasket Seal
18 Section for Wire Connector Part
7 Section for Finger Automatic Gear Shift Mechanism
31 Rod with Six Lugs machined in Screw Machine
25 Heavy Copper Section for Electrical Industry
8 Serrated Brass Rod for Inserts in Plastics
12 Furniture Trim
33 Section for Copper Switch Blade
20 Double Dovetailed Section for Locking Two Parts Together
26 Section for Loom Part

How REVERE INDUSTRIAL EXTRUDED SHAPES Can Speed Production • Cut Down Costs

On some not-too-distant tomorrow, you'll be going again full-blast.

Take Time by the forelock. Investigate today the uses of Revere Industrial Extruded Shapes.

They are made by forcing pre-heated metal through a die of the profile desired. The particular shaping of the die offers wide opportunity for developing *unique* shapes and contours.

A Versatile, Readily-Machined Process

The process is extremely versatile, producing cross sections of unusual form which, in many cases, can take the place of simple forgings, sand or die castings.

Revere Extruded Shapes are readily machined, easily transformed into clean-cut, finished products. With special holders or chucks, odd-shaped sections may be fed, in long lengths, into turret lathes or screw machines where they can be turned or drilled as readily as concentric rods. Their pre-shaped cross-section may eliminate many subsequent milling or broaching operations.

Result: A considerable saving in Tool, Metal and Finishing Costs—an overall saving of time, money, worry —and scrap!

In fact, the use of Revere Industrial Extruded Shapes offers possibilities so numerous that their limitations are determined only by the ingenuity of the user. Available in different alloys and sizes *as well as different shapes.*

Send us a sample or a fully dimensioned profile of your product and we'll definitely let you know if Revere INDUSTRIAL EXTRUDED SHAPES can help cut down your costs and speed production.

FREE We'll be glad to send you for your files our complete brochure for further details on Revere *Industrial Extruded Shapes* ...included also, is much additional information on Revere Copper and Copper alloys and their indicated use in various mechanical industries.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N. Y.

complicated forms as well as edges. One type—002—is made for short-term protection, and the other—003—for longer periods of storage. It is said that the coatings have withstood 100 hours of salt spray testing, using a 3 percent salt solution on steel, copper and brass.

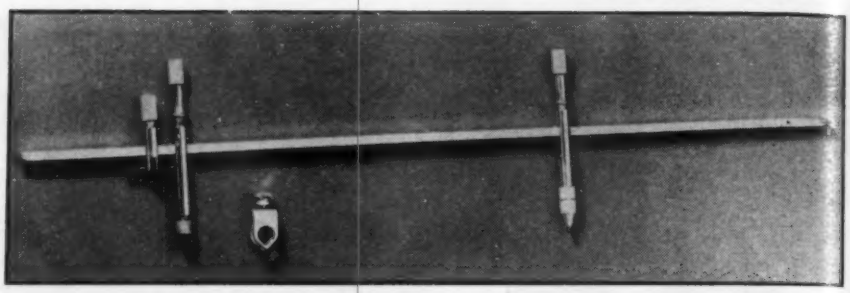
Strickland Ball Joint Vise Holds Tools for Angle Grinding

The Strickland universal ball joint vise made by Wall-Colmonoy Corp., 720 Fisher Bldg., Detroit Mich., is suited for holding chip breakers, curlers and cutting tools while grinding at predetermined angles. The vise is 5¼ in. wide, and 4¾ in. high. It has a range of 30 deg. arc through the horizontal

plane. By matching the ball joint vertical degree graduation with the horizontal degree graduation required, settings are quickly obtained. A single movement of a clamp wrench locks the vise rigidly. The ball and socket are protected by an adjustable leather dust apron.

Greenfield Limit Snap Gage Provides Extended Lower Anvil

The rapid inspection limit snap gage made by Greenfield Tap & Die Corp., Greenfield, Mass., features an extended lower anvil which facilitates inspection, because the work may be readily located and leveled before movement toward the "go" and "not go" anvils. This advantage applies to measuring diameters of round parts and to gaging external length as well as to gaging work in the machine.



Mark No. 10 Beam Compass Has Micrometer Adjustment

Any length of bar, 18, 24, 36 in. or longer can be supplied with the No. 10 beam compass marketed by Mark Specialty Co., 406 Temple Bldg., Rochester 4, N. Y. This compass features a micrometer adjustment at the pivot point to set the measurement to approximately 0.001 in. if necessary. The pivot pin is a phonograph needle that is retained by a nut with the hole having the same taper, thus causing the pin to project only a specified amount.

The chuck pencil holds standard lead or can be replaced with a steel point for scribing on metal. In addition, a clip can be fastened anywhere on the bar to hold a pen, pencil or scriber.

Searchray Electronic Unit Used for Internal Inspection

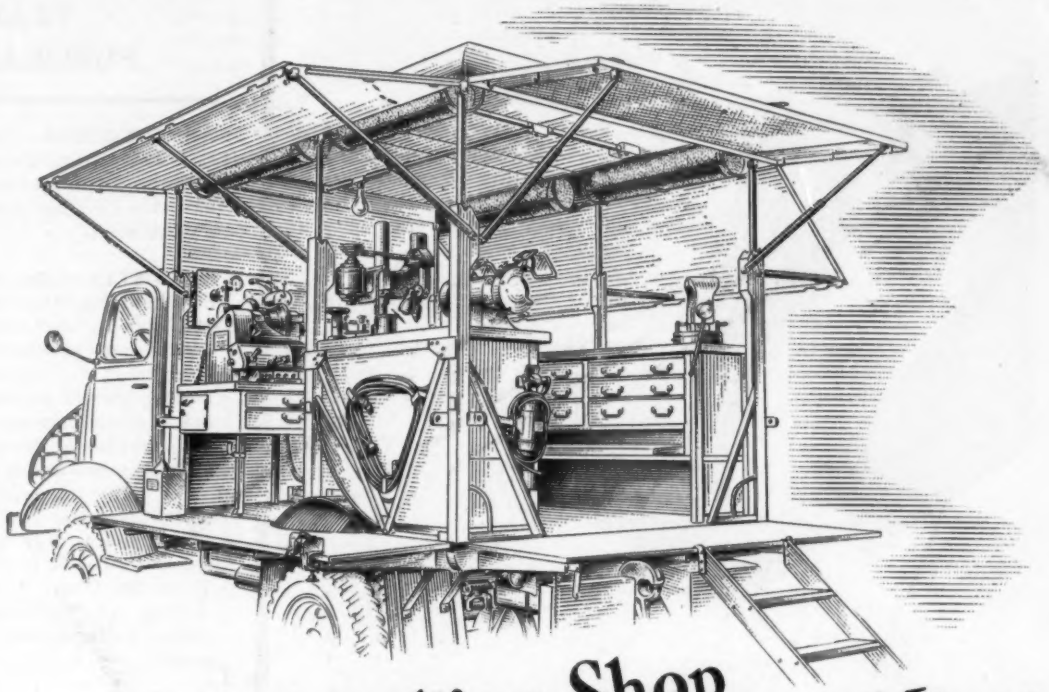
Internal inspection of small parts, molds, castings of light alloys, plastics and rubber, semi-finished and finished products can be made with the electronic Searchray put out by North American Philips Co., Industrial Electronics Div., 419 Fourth Ave., New York, N. Y. This compact X-ray unit plugs into any standard 110 volt power supply. The equipment is 69×26×24 in. deep, weighs 425 lb., and requires less than 5 sq. ft. of floor space.

Searchray is supplied with accessories which permit radiographic examination covering a maximum area of 11×14 in., using standard 12×14 in. X-ray film or paper. Measurement of the article compartment is 21×18×9 in. high. The fluoroscopic screen measures 12×16 in. with 8½×11½ in. being maximum area observable at any one time.

Safety is provided for the operator by a rayproof, shockproof housing with full automatic electric interlocks which interrupt the circuit while the compartment door is open.

Multi-Flanger Uses Cheap Dies on Straight and Contour Work

Flanged edges are produced by the Multi-Flanger on strips or disks, in gages up to 14, the length of the forming operation being unlimited. Inexpensive dies are employed and they are interchangeable in a few moments. The head is adjustable to provide a wide range of operation when working on straight edges, around the edges of disks, or around the inside or outside edges of circles. Both of the operator's hands are free to manipulate the material. The Multi-Flanger is produced by the Riverside Machinery Co., 10632 So. Michigan Ave., Chicago, Ill.



The Mobile Machine Shop Prizes a Part from the Food Mixer

IT MIGHT SEEM strange that a truck equipped to make repairs in the field should find anything of value in a household kitchen mixer. The food mixer is a "lady's man" and so must be trim, light in weight, and stout-hearted. That's why food mixer manufacturers prefer Torrington Needle Bearings—their compact size and ease of lubrication give this modern kitchen equipment much of its "sex appeal."

The mobile machine shop, on the other hand, is *designed* for repair work. Rugged, hard-driven, it is equipped with various kinds of machine tools to do just that. But it was the repair and servicing of planes, tanks and other mechanized equipment "knocked out" in battle that our Armed Forces had in mind when they designed the mobile machine shop. And the Needle Bearing's adaptability to machine tool design looked to Army engineers, as it did to the food mixer people, like just their dish. As it turned out, there were *other* features on the bill of fare of this unusual anti-friction bearing that any repair crew in the field would welcome—the ability to stand up in the severe service a mobile machine shop knows... effective lubrication, low coefficient of friction, increased efficiency of operation...and, of course, the fact that it needs so little attention.

NEEDLE BEARINGS— ALL TYPES—ALL SIZES

NEEDLE BEARINGS TYPE DC are complete, self-contained units consisting of a full complement of rollers and a drawn, hardened outer race. They offer the advantages of small size, low cost, high capacity—and easy installation.

NEEDLE BEARINGS TYPE NCS consist of a full complement of rollers and a relatively heavy hardened outer race. They are furnished with or without inner races. Needle Bearings Type NCS are adaptable to heavier loads than Needle Bearings Type DC.

NEEDLE ROLLERS TYPE LN are produced in a range of types and sizes for assembly on the job into low-cost, high-capacity, anti-friction bearing units. Our engineering department will be glad to advise on the correct size and type for any application.

THE POINT IS YOUR POSTWAR DESIGNS

In considering ways to improve your own product's design for postwar, there's more than one useful idea in the Needle Bearing. For war work has awakened many of *your customers* to the advantages, in performance and cost economy, of compact design, savings in weight, infrequent lubrication and long service life—features which identify the Torrington Needle Bearing. Torrington engineers will be glad to assist you in adapting this new-day bearing to your future designs. Catalog No. 105 listing sizes, ratings and typical applications will prove helpful, also, as preliminary information.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

Makers of Needle Bearings and Needle Bearing Rollers

New York · Boston · Philadelphia
Detroit · Cleveland · Seattle
San Francisco · Chicago · Los Angeles
Toronto · London, England

LET'S GO! WE'RE KEEPING THEM FLYING

TORRINGTON NEEDLE BEARINGS

. . . Yessir, Here's a SMALL COOLANT PUMP *that "has everything"*

BUILT into this compact package of engineering is the same stamina and high efficiency you'll find in the full-sized counterparts. Into its 16-inch height was designed everything to meet the void in the small machine field. Now, operators of small machines, such as surface and internal grinders, hand mills, drill presses, etc., can have dependable coolant flow like that supplied by the full-sized models. Sealless type—mounted on outside of tank or pedestal—with choice of three piping arrangements—with motor and pump fully guaranteed.

PIONEER PUMP & MFG., CO. 19651 JOHN R STREET
DETROIT 3, MICH.

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

BUY WAR BONDS

TRADE PUBLICATIONS

ABSENTEEISM Summerill Tubing Co., Bridgeport, Pa., offers a manual outlining the methods that have proved effective in its plant in reducing absenteeism.

AIR CYLINDERS A 92-page catalog describing its line of air cylinders is available for distribution to manufacturers and engineers by the Tomkins-Johnson Co., Jackson, Mich. This catalog should enable the customer to determine the exact cylinder required for a particular job of pneumatic power movement in his plant.

CLUTCH AND BRAKE FACING A folder and two envelope stuffers published by the S. K. Wellman Co., East 51 at St. Clair, Cleveland, Ohio, describes its "Velvetouch" clutch and brake facings for industrial equipment .

CONTROLLERS Bulletin DM006 put out by the Bristol Co., Waterbury, Conn., contains general information on air and electric operated controllers, recorders and indicators.

CONTROL MOTORS Catalog A5 issued by Automatic Temperature Control Co., 34 East Logan St., Philadelphia 44, Pa., covers ATC Type 3 electrical control motors. It is "designed to serve as an equivalent to an engineer's call—illustrating with photographs and drawings the numerous mounting arrangements with different type valves for the control of air, gas, oil, steam and chemical solutions." Tabular data is included to facilitate selection of the proper control mechanism.

DIE SECTIONS Jessop Steel Co., Washington, Pa., has issued a folder tabulating its rolled bar steel shapes for straight and slightly bent die sections.

DIESEL ENGINES A new publication of Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill., includes a brief history of the company's background, together with particulars on design, manufacture and service facilities applicable to the entire commercial line of its marine and stationary diesels.

DRILL PRESSES A catalog released by Boice-Crane Co., 935 Central Ave., Toledo, Ohio, describes in detail the entire line of 75 models in that firm's 2600 series helmet heads and 1600 series drill presses.

FIBRE Engineering facts are presented in a 36-page book issued by Spaulding Fibre Company, Inc., 310 Wheeler St., Tonawanda, N. Y., for

the dual purpose of presenting engineering reference data in a clear and comprehensive way and of being a source of suggested uses for Spaulding, that firm's products.

FILTERS A booklet published by the Fostoria Pressed Steel Corp., Fostoria, Ohio, describes the application of its filters to the clarifying of coolant solutions used on machine tools, and gives a guide for correct selection of filter size and number for various kinds and makes of machine tools.

GEARSHIFT DRIVES Lima Electric Motor Co., Lima, Ohio, has issued a catalog describing and picturing typical installations of its gearshift drives for machine tools and production equipment. Included also are pictures and descriptions of its pedestal grinders, electric motors and magnetic polishing lathes.

HEAT TRANSFER EQUIPMENT Catalog 143 summarizes the various heat transfer products — radiators, evaporators, condensing towers, oil coolers and unit heaters—manufactured by the Young Radiator Co., Racine, Wis.

HYDRAULICS The Denison Engineering Co., 1195 Dublin Rd., Columbus, Ohio, has issued a 4-page circular illustrating examples of its hydraulic equipment for control of machine movements.

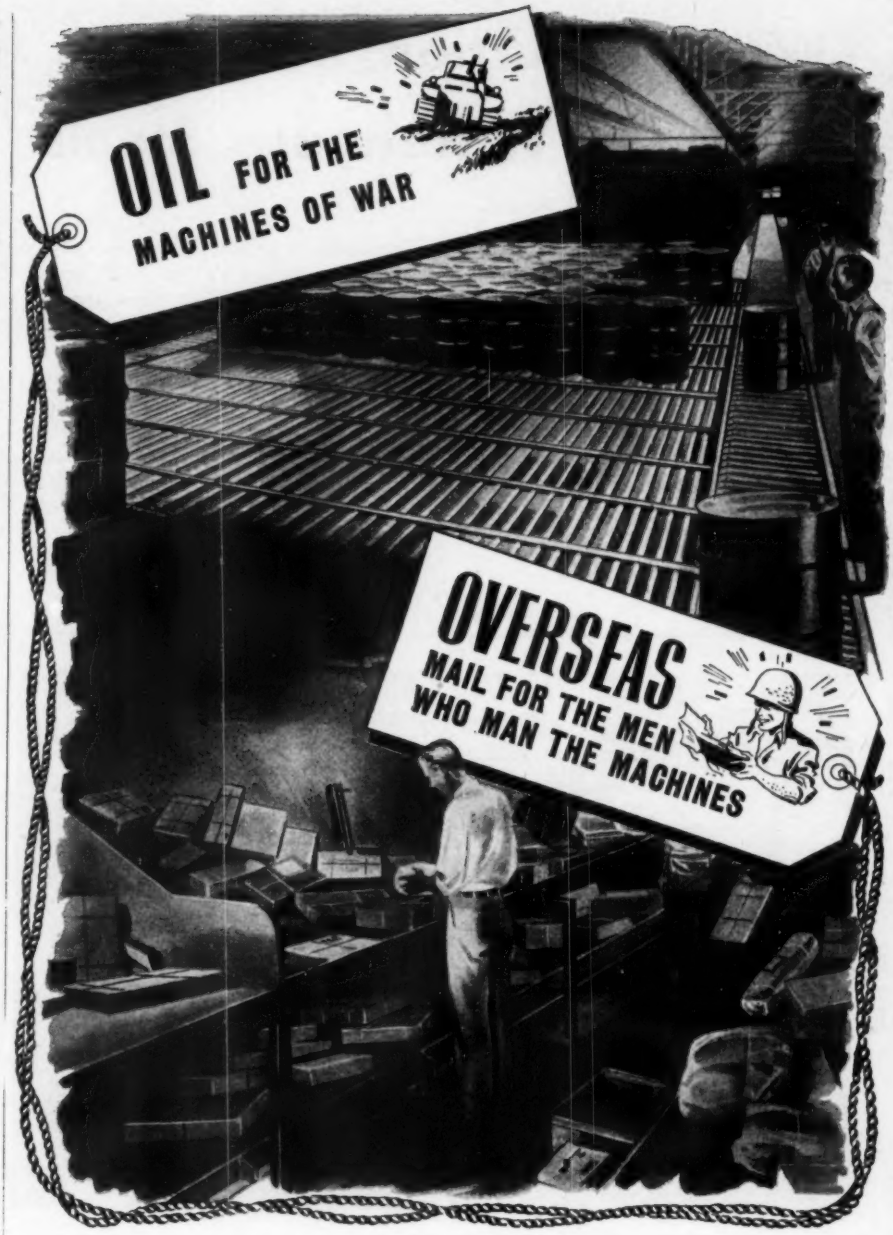
HYDRAULIC PRESSURE PUMPS Watson-Stillman Co., Roselle, N. J., has just issued bulletin 250-A, presenting a comprehensive coverage of its line of hydraulic pressure pumps. Illustrations show several of the more popular models, with separate illustrations of the important parts.

LABORATORY PRESSES Bulletin 350-A, issued by the Watson-Stillman Co., Roselle, N. J., gives a complete picture of the company's line of hydraulic laboratory presses and equipment. Copies are available upon request on business letterhead.

LATHES Bulletins 443-1, 2 and 3, published by Sommerfeld Machine Co., Braddock, Pa., present pictures, description and specifications of 27 and 32 in. heavy duty, 36 in. medium duty, 33 and 42 in. heavy duty and 50 and 60 in. heavy duty lathes.

MOTOR AND GENERATOR MAINTENANCE A handbook issued by the Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill., "tells how to keep motors and generators operating continuously at peak efficiency without dismantling."

MOTOR BUYING DATA Available only through the company's district offices, as announced by Westinghouse Electric & Mfg. Co., the 180-page loose-leaf manual, "Motor Buying Data,"



. . . When Time Is Vital
Standard Conveyors Expedite Handling

Oil is but one of many essentials of war whose handling is speeded up — in production and shipping — by Standard Conveyors.

Parcels and packages, destined for soldiers at home bases or overseas, are swiftly handled and dispatched with the aid of Standard Conveyor equipment in many metropolitan post offices.

Whatever the commodity, planned handling with Standard Conveyors assures uninterrupted flow and movement.

Whatever you make or handle now — or expect to in the future — Standard Conveyor Company has the "know how" for the building and use of power and gravity conveyors to your best advantage.

•

Write for valuable reference book—"Conveyors by Standard" Catalog No. AM 9.

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STANDARD CONVEYOR COMPANY
General Offices:
NORTH ST. PAUL, MINNESOTA
Sales and Service in All Principal Cities

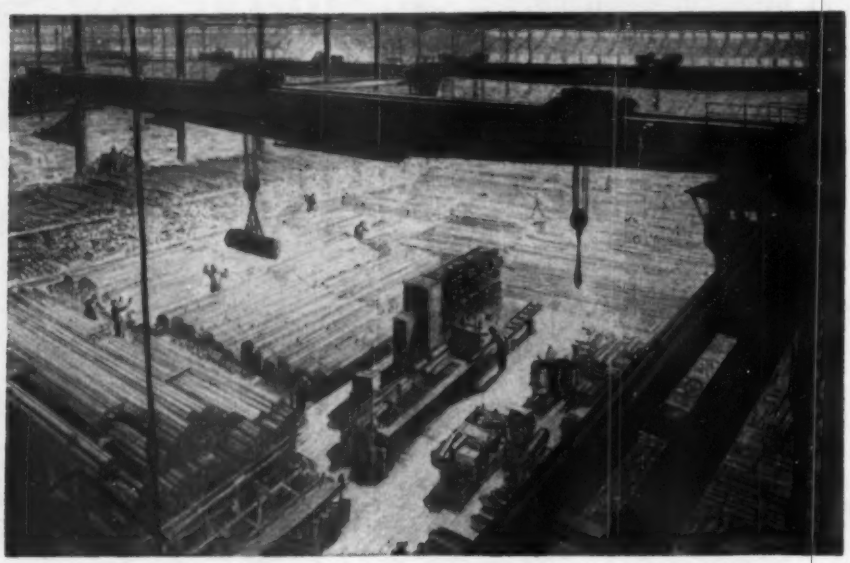
★ ENGINEERED FOR FASTER PRODUCTION ★

War Production Relies On Warehouse Steels

Literally thousands of kinds, shapes and sizes of steels must be immediately available for industry if the nation's war production and other essential industries are to function efficiently. Warehouse distributors, who normally carry steels in stock as a peacetime enterprise, today find themselves in a position of strategic importance . . . serving all industries, and making every piece of steel count for victory.

The recent "Share the Steel" campaign launched by the WPB calls on companies to cut their inventories to a minimum and release idle steel stocks . . . hoping to gain some 2,000,000 tons of steel urgently needed now in war production. This plan places double importance on those organizations such as Joseph T. Ryerson & Son, Inc., who carry steel in stock for the use of all industries.

(See Advertisement)



STEEL—In Ryerson Stock *for Immediate Shipment*

Pictured above are steel stocks in one of the ten Ryerson plants. Ready for immediate shipment are thousands of kinds, shapes, and sizes of steel to fill the requirements of war industries and the manufacturers of essential civilian goods.

Rush orders, equipment breakdowns as well as the normal demand for small lots of steel make it highly important to have a source ready with the right steel to meet all emergencies.

The ten Ryerson Steel-Service plants are geared for just this operation. The steel carried in Ryerson stock makes it practical for manufacturers to reduce high inventories—eliminate idle steel and make every ton work for victory. Call your nearest Ryerson plant when you need steel.

JOSEPH T. RYERSON & SON, Inc.

Steel-Service Plants at: Chicago, Milwaukee, St. Louis, Detroit, Cincinnati, Cleveland, Buffalo, Boston, Philadelphia, Jersey City

covers popular types and ratings of motors up to 100 hp., gearmotors and motor-generator sets. A similar publication, "Controlled Buying Data," (276 pages) lists controls and accessories for d.c., single phase, squirrel cage and wound rotor motors.

PIPE THREADING Manuals covering the operation and maintenance of the portable and stationary pipe threading machines of the Oster Manufacturing Co., East 61 at Carnegie Ave., Cleveland, Ohio, has been issued by that firm.

POLISHING The James H. Rhodes Co., 157 Hubbard St., Chicago, Ill., has made available a handbook and catalog on polishing. Contained is a detailed outline of the proper way to set up polishing wheels, and information on the care and maintenance of felt bobs and wheels.

POWER TRANSMISSION Cling Surface Co., 1048 Niagra St., Buffalo, N. Y., tells in a new booklet of the necessity for a planned maintenance program for power-transmission equipment and gives suggestions for its salvage. How to use the company's belt dressing is included, along with many practical hints on the foregoing topics.

REAMERS A bulletin describing its line of small diameter reams with flutes ground out of solid stock is available from the Barber-Colman Co., Rockford, Ill.

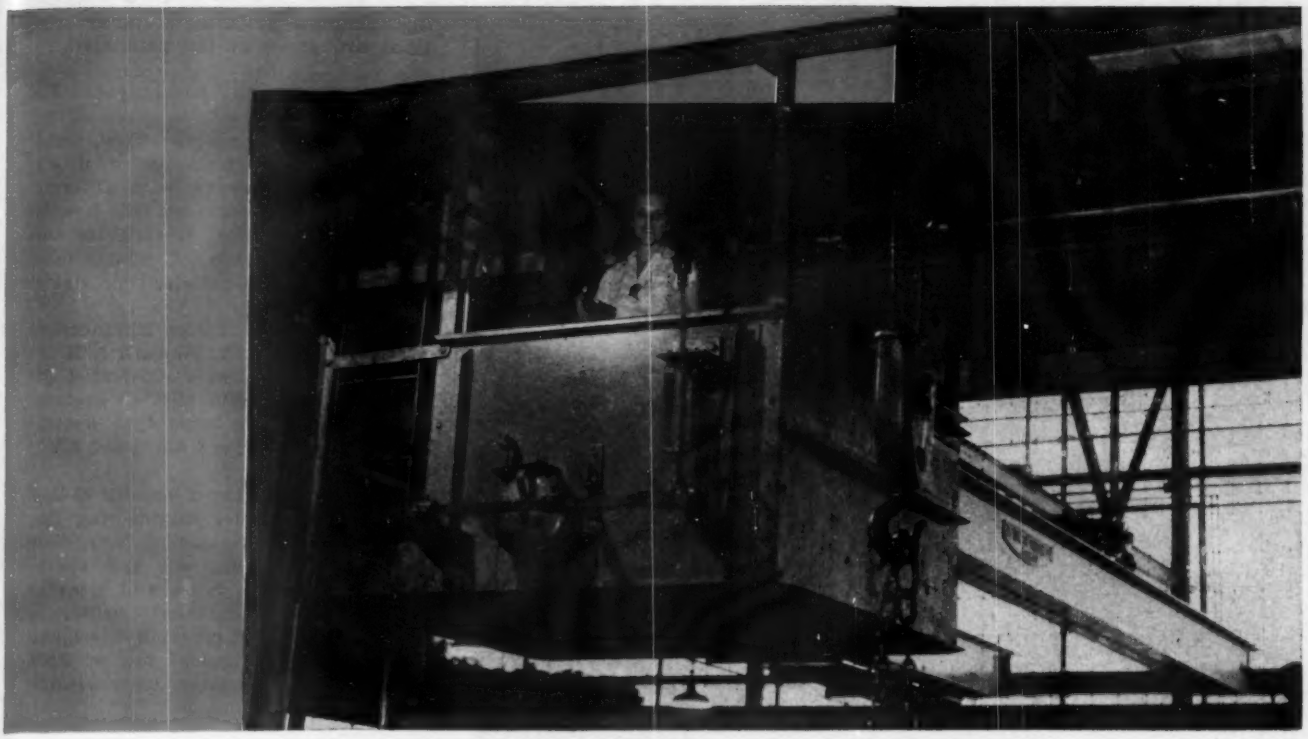
RINGS A file-size catalog issued by Dresser Mfg. Co., Bradford, Pa., presents that firm's line of "Rings of any size and many shapes, ferrous or nonferrous."

SAFETY REGULATIONS General Electric Co., Schenectady, N. Y., offers single copies of publication GEQ-217, entitled "Safety Regulations for Women in Industry," a booklet prepared especially for its own workers employed for machine tool operation.

SLOTTER Rockford Machine Tool Co., 2498 Kishwaukee St., Rockford, Ill., has prepared a broadside describing, illustrating and giving specifications of its 12-in. "Hy-Draulic" slotter.

STEEL, ALUMINUM COATED "Armco Aluminized Steel," is a guide to the use of aluminum-coated steel. It gives gage and weight limits and information on the qualities and characteristics of the recently-developed sheet. Physical and chemical properties and welding methods are described. It is available from the American Rolling Mill Co., Middletown, Ohio.

THREADING A pamphlet describing precision thread rolling machinery produced by Watson-Flagg Machine Co., Paterson, N. J., is available from W. A. Schuyler, 250 West 57 St., New York City 19, N. Y., selling agent.



WOMEN WORKERS AT WYCKOFF
SPEED COLD FINISHED STEELS
TO OUR FIGHTING FORCES

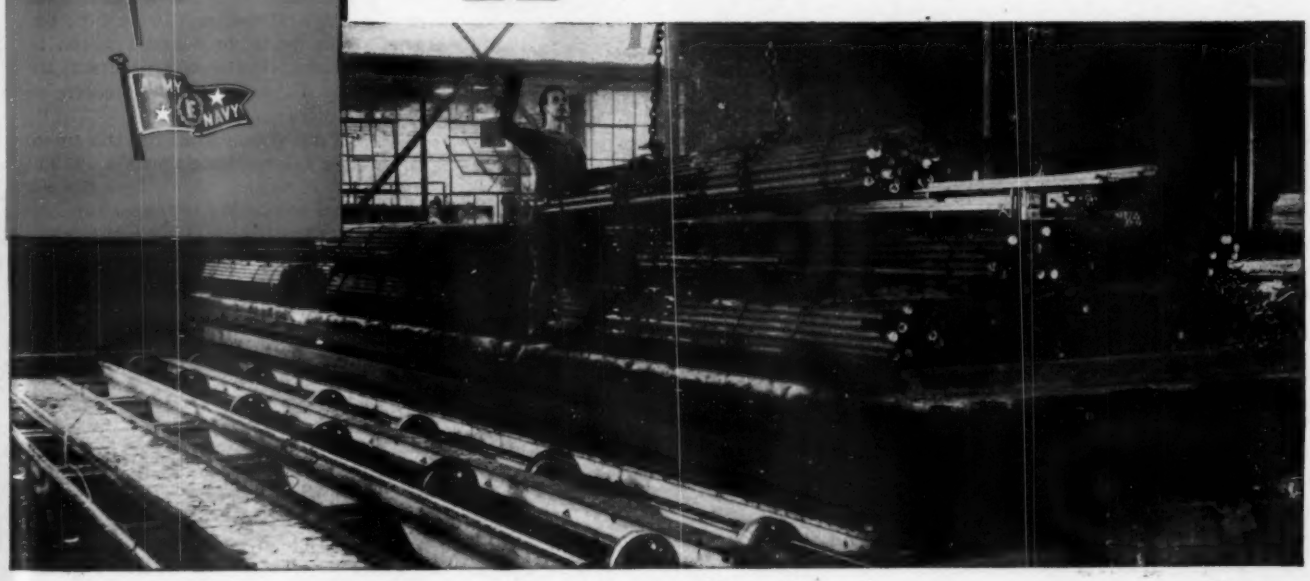
Carbon and Alloy Steels—shafting, flats and other essential forms are rushed from final inspection stations at Wyckoff to steel-hungry war production centers. We are justly proud of Wyckoff women . . . of the splendid job they are doing . . . and the hundreds of Wyckoff men on production and fighting duty!

Wyckoff has one objective . . . to do their part in winning this war by producing more top quality steel, faster!

WYCKOFF DRAWN STEEL CO.

FIRST NATIONAL BANK BUILDING, PITTSBURGH, PA.

3200 SO. KEDZIE AVENUE, CHICAGO, ILL.



HIGH SPEED protection . . .

■ With industry geared to a constantly increasing tempo, high production rates must be maintained over long periods of time. Long runs, multiple shifts, extended hours . . . these and other emergency conditions make efficient lubrication all the more essential. BIJUR automatic "metered" lubricating equipment is doing its part in assuring quality production at top speeds.

BIJUR LUBRICATING CORPORATION, LONG ISLAND CITY, N.Y.

BIJUR

AUTOMATIC *Metered* LUBRICATION

1725

Specifications, advantages and descriptions are given in the pamphlet.

WELDING A vest pocket guide for welders (EW-95) has been issued by the Hobart Brothers Co., Troy, Ohio. In pictures and text matter it explains what is wrong with different types of faulty welds and tells how to correct these faults. It suggests and illustrates all kinds of joints, fillet welds and how to cut electrode waste.

WELDING The Eisler Engineering Co., 740-770 S. 13 St., Newark 3, N. J., has issued a profusely illustrated 28-page special bulletin 93-W-43 describing its line of light bench type electric spot welders ranging from ¼ to 3-KVA.

WELDING Illustrated bulletin 92-W-2 ssued by the Eisler Engineering Co., 740-770 S. 13 St., Newark 3, N. J., lists all features, applications and operations of available types and sizes of small and heavy duty butt welders it manufactures, and especially designed for welding of wires as low as 0.008 in diameter of tungsten, molybdenum, nickel and copper.

NEW BOOKS

DIE ENGINEERING LAYOUT AND FORMULAS —*By C. W. Hinman. 497 pages. Published by the McGraw-Hill Book Company, 330 West 42 St., New York, N. Y.* $5.

It is generally acknowledged that the battle of production is playing a big part in winning this war. But few laymen know the importance of the tool engineer in this battle.

A good tool designer can save thousands of man-hours of labor in the shop. Upon his ingenuity and familiarity with basic principles of jig and die design may depend the success of a war production line.

It is fitting, therefore, that we have another volume directed to the tool engineer. Mr. Hinman, the author, has geared his work to current needs by basing many of the 400 practical examples of die construction directly on war products.

This is not to say that his treatment is suitable for wartime needs only. The approach is basic, which has the advantage of rendering real assistance to tool designers who will have the job of translating wartime engineering advances into postwar uses.

The volume is based entirely on tools and procedures for working sheet metal. The greater part of it deals with die design, but there is additional material describing types of presses, and a few chapters dealing with the fabrication of sheet metal after blanking and forming. Included in this material is a chapter on welding because of the importance of this fabricating method in modern sheet-metal construction.

A good deal of the material in the

VICKERS HYDROMOTIVE CONTROLS *Help Conserve* Cutting Tools

Tool breakage and excessive tool wear is costly and annoying at any time . . . but it is extremely serious in war time. This wastage of tools has assumed such proportions that the War Production Board has launched a program of tool conservation.

Longer tool life and greater tool efficiency can be designed into many machines simply by equipping them with Vickers Hydromotive Controls. With Vickers equipment you can provide the exactly correct speeds and feeds for each tool and job. Feed rates are infinitely variable; exceptionally accurate adjustment is possible by simply turning a dial; set feeds and speeds are maintained regardless of variations in work resistance; adjustments can be made during cycle. While cutting, the tool is always protected against abuse due to overload by automatic hydraulic pressure limitation. Any desired control sequence can be set up and made as automatic as expedient. Controls can be interlocked so that it is impossible to do the job wrong—impossible to jam and break tools. Exact load limitations can be applied so the machine cannot be overloaded.

Vickers Application Engineers are available to discuss the many opportunities for improved machine controls.

VICKERS *Incorporated* • **1410 OAKMAN BLVD.** • **DETROIT 32, MICHIGAN**

Application Engineering Offices: CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • ROCKFORD • TULSA • WORCESTER

CONSTANT DELIVERY PUMPS

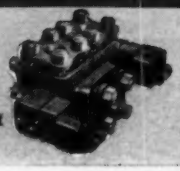
FLUID MOTORS

VARIABLE DELIVERY PUMPS

CONTROL ASSEMBLIES

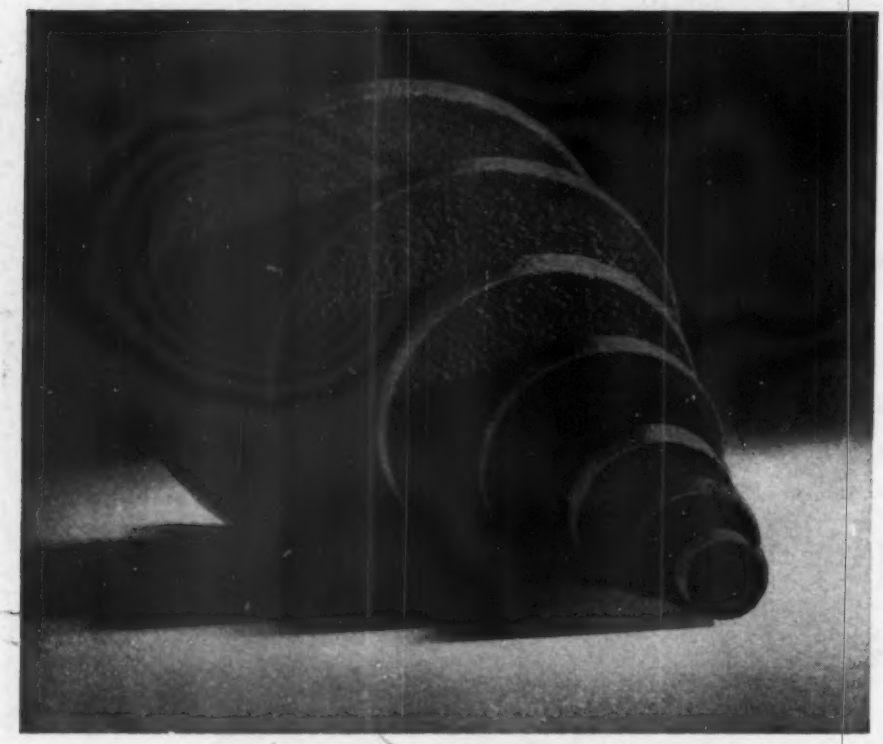
Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function

VOLUME CONTROLS



DIRECTIONAL CONTROLS

PRESSURE CONTROLS



Yes

WE DELIVER ON TIME

No holding up vital jobs while you wait for your grinding wheels or mounted wheels.* Timing and scheduling are everything now. That's why our streamlined QUICK SERVICE is such an important asset.

Fully approved and endorsed by W P B, here's our wartime speed setup:

- Manufacture only wheels 3" in diameter and under. To speed production, larger sizes are eliminated for the duration.
- No quitting whistle. We are on the job making wheels 24 hours a day, every day.
- Our central location brings us closer to many plants. No time lost in transfer connections or long distance shipping.

CHICAGO GRINDING WHEELS

The wheels of proved quality — known for performance, cutting and long life.

Any shape, grain and grade, any size up to 3" in diameter. From this army of wheels you can select one custom built for your job.

TRY ONE—Tell us the kind of equipment, the job, and size wheel you want to try. We'll send it postpaid.

CATALOG MAILED ON REQUEST

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St. Dept. AT Chicago, Ill.

AMERICA'S HEADQUARTERS FOR MOUNTED WHEELS SMALL GRINDING WHEELS

* Half a century of specialization has established our reputation as the Small Wheel People of the Abrasive Industry. You can bank on us.

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Interested in
☐ Grinding Wheels
☐ Mounted Wheels
☐ Send Test Wheel
Size .....
Name .....
Address .....

book is based upon the author's contributions to AMERICAN MACHINIST and to other business publications. Its pages are well supplied with illustrations and tables which make it a working manual for the tool engineer.

SEEN and HEARD

By JOHN R. GODFREY

Grinding or Rolling?

Thread rolling began many years ago. One of the early applications in this country was the rolling of threads on track bolts at the Simonds plant in Fitchburg, Mass. John J. Grant had a finger in this if recollection serves. They used rotary dies, the outer die having inner threads and the inner die threads on the outside. They were set eccentrically.

Then came the flat dies which still hold in most cases. These were largely developed in the Waterbury district by Manville and others. From these machines came the millions of stove and other bolts, bicycle spokes and the like.

Thread grinding began with tap work. A toolmaker at Watervliet Arsenal ground taps in a milling machine in the early 1900's. John Bath did a lot of pioneer work on this in Worcester, perhaps ten years later. Now it is common practice not only for taps but for cylinder studs for airplane engines and such work.

The British are finding that even the high tensile steel used in these airplane studs can be rolled to advantage. They are using rolls instead of flat dies. The work rests on a support as in centerless grinding and they seem to be well pleased with the results. The thread diameter is the same as the body size —or smaller if desired.

Old Autos Help

Old automobiles afford material for a lot of various mechanisms for the shop man with a little ingenuity. Old transmissions are found as gear shifts on many machine tool modifications, both for drives and feeds. A recent shop visit found the differential of an old Nash car used as the basis for a small automatic machine.

A small motor was V-belted to the drive shaft and a special chuck put on the end of one axle shaft. The other was removed. Belts from the same motor drove a very ingenious feeding mechanism which made this into an automatic forming lathe for a special job.

Another shop needed several pumps to supply coolant to drills that were overheating when run dry. No suppliers had any, so the mechanic visited an auto junk yard and borrowed enough of the water pumps from old cars to fill the bill.

How 15 midwest plants found the answers to baffling wartime problems

YOUR MAIN CONCERN, these days, is to get on with the war... and so is ours. To that end, we suggest you read, on the following pages, typical examples of Lubrication Engineering at work. See the great step-up in man and machine production that many plants have secured.

This is a service of specialists... lubrication and cutting oil specialists. Their "know-how" comes from the great fund of practical information which is the background of this company, and from rubbing shoulders with plant men in solving many a problem. The experiences of all these specialists is pooled, so that the experience of one is the experience of all. And when more help is needed, they have at their disposal all the resources of our Technical and Research Departments.

It's a set-up for solving problems. Better turn it loose on some of yours.

LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

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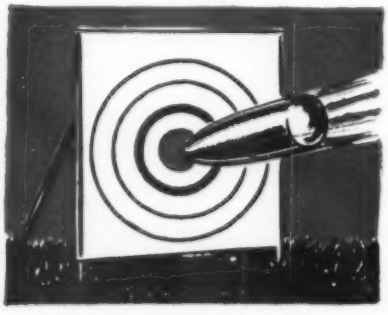
Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

SEPTEMBER, 1943

Easy on . . . easy off . . . and no rust! Rust trouble nagged a midwest operator, sub-contracting on malleable cast iron fuse adapters for 5" explosive shells. After the last machining, parts were blast-cleaned and packed for delivery to a nearby plant, where two weeks sometimes elapsed before they were needed. That's when rust got in its "licks," and some of the parts required refinishing. It was not considered practical to use heavy type anti-rust products because of the expense and trouble in removing them. After a Standard Oil Engineer recommended Superla Soluble Oil, all trouble disappeared. The pieces were dipped in a 5-1 mix of water and Superla at 120-130° F., and allowed to drain in baskets before packing. Advantages: low cost of application, ease of handling, no rust.



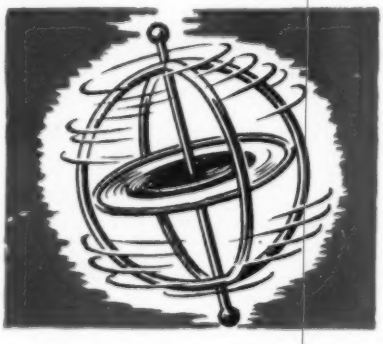
Right on the nose. A northwest cartridge maker is now delivering a product with better firing accuracy as a result of switching from high melting point wax to a special formula compound for application as a lubricant to the bullet or nose end. This is the only product the plant has found that will not run back into the powder when the cartridges are stored.

Overheating and tolerance problems solved. A St. Louis manufacturer was getting overheating and tool burning in drilling a ¼" bar of 18-8 stainless steel to secure a 1/32" wall. A Standard Oil Engineer recommended a 1-5 mix of Stanicool HD Soluble Oil, and the trouble was ended. 50% production losses were eliminated, and

the number of operations was reduced.

The same product, in identical proportion, was used in this plant to secure tolerances of 0.001" in all four dimensions, in machining an end bearing from cold rolled steel. If you have cutting problems that require a combination of long tool life and exceptional cooling, it will probably pay you to investigate Stanicool.

All metals look alike. A Wisconsin manufacturer finds Stanicut 107BC an "all-round champ." Machining gyro-



scope parts with a wide range of both ferrous and non-ferrous metals, this operator uses Stanicut on all of them, gets good finish and tool life on the steel jobs, and no tarnishing on the bronze or brass ones.

Handles variable composition in metal handily. Variations in the heats of X-1335 steel caused a Wisconsin plant much grief in tapping both the bowtail and nose-ends of 40 mm. shells. In fact, seventeen oils were tested before the answer was found. The eighteenth and last oil was recommended by a Standard Oil Engineer—Stanicut 309 BCS for the difficult heats, and the same oil, thinned with 25% Mineral Seal Oil, for ordinary heats. This turned the trick.

Help in honing. In a honing job which removes .009" to .014" from 6-inch sleeves, an Indiana plant secured improved finish without additional operations—using 60% Stanisol and 40% Acme Base Oil Extra Heavy.

Oil is ammunition . . .

Use it wisely

When you bump up against special cutting oil problems

If you are running into trouble in handling war work, and find it tough to get the necessary accuracy, finish, and tool life on converted machines . . . or if you have other perplexing machining jobs that a more efficient application of cutting oils may help answer . . . call in a Standard Cutting Oil Specialist. Phone or write Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago 5, Ill., for the Engineer nearest you. In Nebraska, contact any Standard Oil Company of Nebraska office.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

No mixing . . . no mixup. A Michigan plant turning small rifle parts found that Stanicut 137 BCS gave much longer tool life than the base oil—paraffin oil mix formerly used. The use of Stanicut automatically eliminated a mixing operation and the chance of a mixup in mixing; and the use of one product simplified the jobs of ordering, stocking, and issuing.

No smoking allowed. A Missouri airplane plant ran into a mess of trouble in cutting layers of aluminum sheets, bolted together with the pattern to a total thickness of ½". Past experience with soluble oils was discouraging—separation of the emulsions had been bad. But with cutting oils, smoking occurred—and the plant is windowless! Reduction in oil feed was tried. But the machines, which operated at 15,000 RPM, heated up so that the cutters would break.

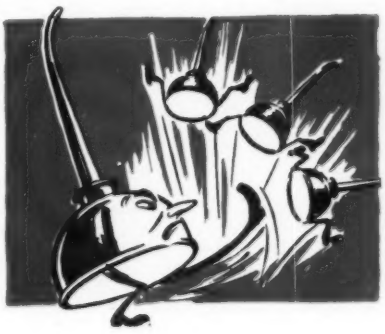
A Standard Oil Engineer supplied the answer—Superla Soluble Oil. Smoke trouble went up into thin air. So did the separation difficulty. Cooling naturally increased so that cutter breakage became negligible.

Gets 400% increase in die life. A midwest range manufacturer, now cold nosing 75 mm. explosive-type shells on a vertical press, secured a 400% increase in die life, with an overall cost saving of 65%. This happened when he switched to a special Standard Oil Company cold nosing compound. This lubricant has a real nose for economy.

More than skin deep. Stanicut 107 BC has minimized the problem of skin irritation for a Chicago plant that is producing 20 mm. shells on automatics. In addition, the manufacturer reports, it is far superior to cutting oils previously used for forming, drilling, reaming, knurling, etc.

Tool life up 200-400%. That is what happened in an Illinois plant making 30 calibre cores. Cause: A switch from competitive oils mixed with varying proportions of paraffin oil. The new oil: A special formula cutting oil. Actual figures: Before switching, tools needed grinding every six to ten hours; after switching—thirty hours.

Stepping into the broach. An Indiana supercharger manufacturer was having broach loading trouble in making a 27-spline part from a special stainless steel. Variation in size was also experienced. The broach loading was solved by a special broaching oil. The variation in size difficulties were overcome by installing an oil cooler to maintain the temperature of the oil at 55-65° F. to the machine. These Standard Lubrication Engineers are practical!



One oil replaces three . . . and did it so successfully that the customer—a famous midwest pencil maker—at once ordered tests made of various other Standard Oil products. The oil was Stanicool H.D. Soluble Oil and it proved superior to three oils used for forming, drilling, reaming, cutoff, threading, tapping, and grinding. In test after test, Stanicool H.D. has shown that it can supply the cooling power of soluble oil and approximate the tool life of cutting oils.

Cuts lube oil consumption 25%. A Wisconsin iron working plant has been using Stanolex 31 on the ways of planers and shapers since April, 1942, in place of red engine oil. Since then, says the superintendent, oil consumption has been cut 25%, machines stay cleaner, and a far better job of lubrication is being done.

Stanolex was developed especially to give ways and guides adequate lubrication under the heavier cuts and higher speeds you are using today. Ask a Standard Lubrication Engineer to make a test of this oil on one of your hard-pressed machines. You, too, may find that it can help overworked machine tools turn out heavy quotas.

Precision grinding problem solved. Grinders were giving a northwest operator trouble because the water pump grease recommended worked under the slides and threw the work off as much as 0.003". A Standard Oil Engineer was called in, and suggested Standard Viscous Track Roller Lubricant No. 1. Result: Only a thin but tough, adhesive film which did not change the measurements.

Where Standard Lubrication Engineering is available. You can secure help on your cutting or lubrication problems in the Midwest and Rocky Mountain states shown above. Phone or write the nearest Standard Oil Company (Indiana) office, or 910 S. Michigan Ave., Chicago 5, Ill., for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Oil is ammunition . . . Use it wisely

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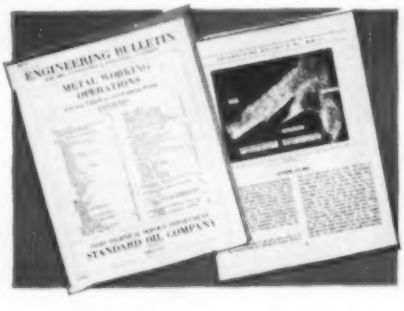
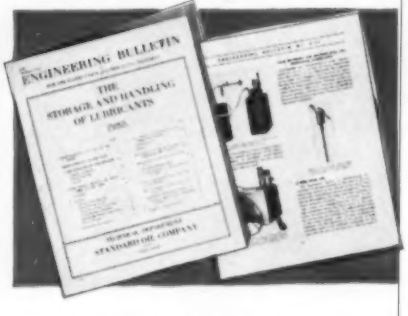
For Helpful information and literature

See the Standard Oil Man when he calls

He'll have helpful information on two mighty important details of your metal working operations . . . cutting fluid recommendations and machine tool lubrication. He can help you two ways. On specific problems his experience in other plants may enable him to make on-the-spot recommendations that will save you hours of experimental work. For general information he has Engineering Bulletins prepared by the technical staff of Standard Oil. Two of these are described below. Others are available on the lubrication of bearings, power transmission equipment, etc., and the use of rust preventives, quenching and tempering oils, etc. This literature and service is available to all war plants throughout the Middle West. See that it is put to use in your plant. See the Standard Oil Man *yourself* when he calls.

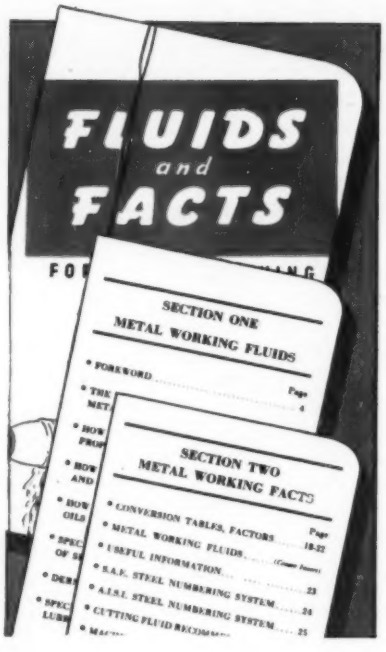


"Metal Working Operations—Cutting, Grinding, and Forming Fluids." This bulletin contains the latest information on the action and functions of cutting fluids. It briefly describes various types of metal working operations and the kind of fluid generally recommended for them.



"Storage and Handling of Lubricants." Describes various causes of contamination of lubricants in storage and suggests ways to avoid it. Suggests methods of oil room management, and offers ideas for distributing and dispensing lubricants and cutting fluids to avoid mixing brands in application.

Write for this convenient pocket-size handbook



Men new to the metal working industry, and many old hands, will find much useful data in this forty-page, pocket-sized booklet. It outlines the need for cutting oils and coolants and suggests qualities to look for in selecting them. Cutting fluid recommendations given for various types of operations are based on machinability ratings of the metal used. For copies, ask the local Standard Oil Company (Indiana) office, or write 910 S. Michigan Ave., Chicago 5, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

Oil is ammunition . . . Use it wisely

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

One more for Eddie before we quit!

P&H HEVI-LIFT HOISTS

"Goodness only knows where Eddie is by this time! But to him — and to the rest of the boys at the fighting fronts — we're saying it with production."

Thanks to "thru-the-air" handling with P&H Electric Hoists, production is moving faster, more efficiently than ever before; war workers are accomplishing more per shift.

There's no place in today's production for the drudgery that tires men and women long before the day's work is finished — not when these tasks can be done so much more quickly, without effort — by simply pressing buttons.

Whatever your materials handling problem may involve, your inquiry will receive immediate attention.

Available in all capacities up to 15 tons. Executives interested in information about the many ways P&H Electric Hoists can serve war industries should write us without delay.

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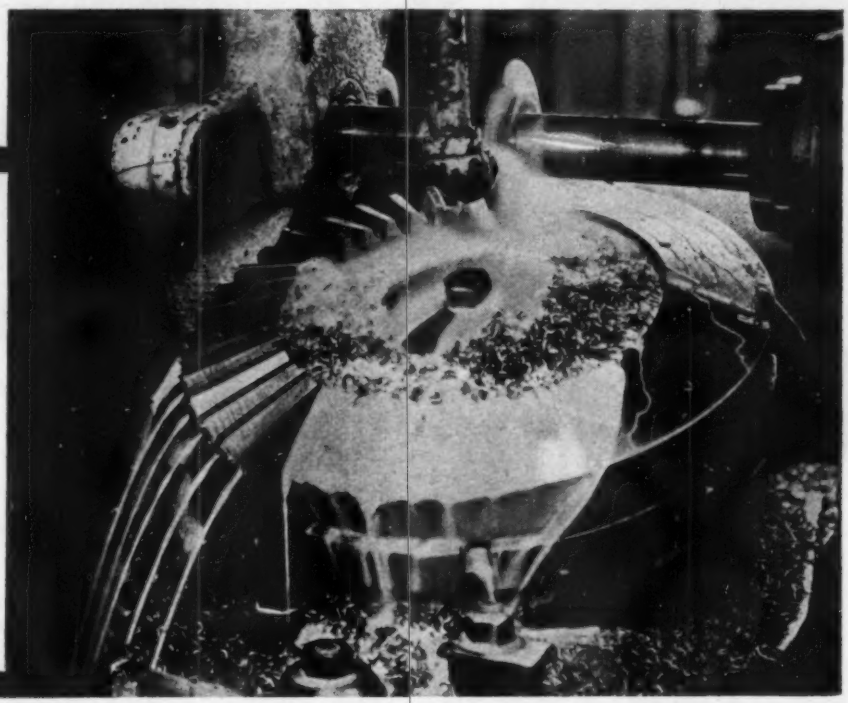
. . . SINCLAIR CUTTING OILS and COOLANTS. For the great variety of metals and operations requiring individual treatment Sinclair provides a diversified line of specialized oils adapted to every problem.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



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NOTHING BETTER!

Now Ready—this descriptive Victory Cobalt folder. Write for your copy.

Conserving strategic alloys—yet delivering *increased cutting service* on heat treated steels, cast iron and other tough assignments—this new CLASS A High Speed Steel is in a class by itself for efficiency. Check Victory Cobalt's performance on *your* current production—measure its long-wearing life!

Vanadium-Alloys

STEEL CO. LATROBE, PA.

McCASKEY

TOOL CRIB CONTROL assures

*MORE PRODUCTION with **LESS TOOLS

Tool Crib at Philadelphia Gear Works, equipped with McCaskey Control.

* TIME SAVED IN TOOL CRIB SERVICE

Time studies, confirmed over and over again by every day experience, have shown that tool service with McCaskey Control is much faster than with checks and other systems. More production is the direct result of reducing the non-productive time required for drawing and returning tools. There are no delays at the windows of McCaskey equipped cribs.

Production also is increased by having all the tools in the bins in good condition, ready for use—speeding production and reducing spoiled work.

TRANSACTIONS SPEEDED UP

The tool supervisor of a large brass manufacturer says: "The use of McCaskey Tool Control saves hundreds of hours a week for our set-up men, machine operators and crib attendants and has enabled us to materially reduce our crib inventory."

** TOOLS NOT IN USE CONSTANTLY AVAILABLE

McCaskey provides a simple means for enforcing the return of tools when a job is completed. Tools are kept in constant circulation. They are immediately available instead of accumulating in operators' tool boxes. No time is wasted locating tools that are out, whether loaned to employees or out for reconditioning. You may check, in a moment, where they are and when they were taken out.

McCaskey aids tool conservation by reducing loss, theft and breakage and keeping your entire inventory on the job all the time.

SMALLER CRIB INVENTORY

From the Comptroller of a large electrical manufacturing company: "We also have a *better balanced* tool inventory with smaller crib stocks of numerous items (thru McCaskey). Our tool investment has been reduced and time is no longer wasted seaching for tools on the production floor."

Investigate the possibilities of McCaskey for speeding up *your* production and conserving *your* tools. Qualified industrial representatives are available to demonstrate how easily and inexpensively you can have *"more production* with *less tools* thru McCaskey". Write us for facts today.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Ontario, Canada

The McCaskey Register Co., Watford, England

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PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

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SANDERS and GRINDERS
GIVE YOU
Finer Finishing Faster!
SKILSAW PORTABLE GRINDERS
Grind down raised welds faster. Light, compact, powerful. Perfectly balanced for easiest day-long operation. 2 MODELS.

Have you welds to grind . . . metals to clean or "final-finishing" to apply on wood or brass or steel? You can do each job better *and faster* with one of these SKILSAW TOOLS! They're specially designed for easier handling. They're skilfully engineered for greater output per man *at war-time production speeds.* They're ruggedly built to stand the gaff of toughest 3-shift operation without time-wasting breakdowns.

Do you wonder why these SKILSAW SANDERS and GRINDERS are favorites everywhere for coarsest grinding or finest buffing. Ask your distributor for a demonstration and see for yourself!

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SKILSAW DISC SANDERS
Speed up all metal cleaning, sanding, filing, grinding with wire brushes (*illustrated*) cup wheels, polishing pads, etc. 6 MODELS.

SKILSAW BELT SANDERS
Produce a smoother, better "final finish" *10 times faster than by hand* . . . on wood, metals, plastics, compositions. 4 MODELS.

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

NICKEL AIDS THE RAILWAY INDUSTRY

to KEEP 'EM ROLLING!

Railroad men perform near-miracles every day. With less locomotive capacity and fewer freight cars than a decade ago, last year they moved about two-thirds more ton-miles of freight and over 100% more passenger-miles than in 1940. Figures for this year show substantial increases.

Now, with locomotive-miles per month boosted about 40% above the pre-Pearl Harbor figure, railroaders rely upon the enhanced mechanical properties Nickel adds to iron, steel and non-ferrous alloys.

Fortunately, engineering and operating departments have long known that, properly used, a little Nickel goes a long way to prevent fatigue failures and lengthen service life. It has been widely specified, to A.A.R. standards, for steam and Diesel locomotives, passenger equipment and freight cars that eliminate deadweight tons. Materials strengthened and toughened by Nickel are now staying on the job . . . despite overloads and stepped-up schedules.

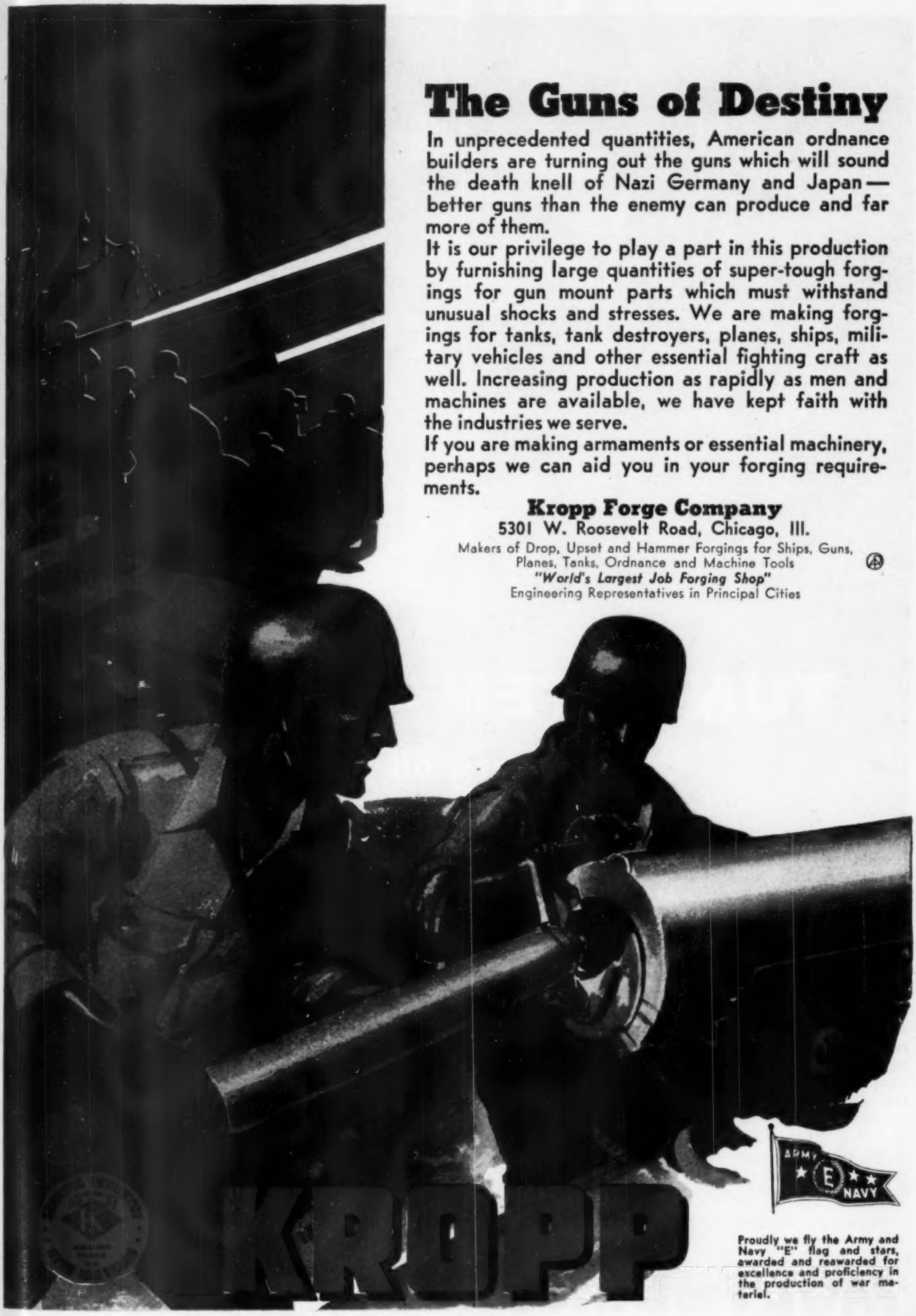
During years of peace it has been the privilege of International Nickel technical staffs to cooperate with the men who build and operate all types of railway equipment. Now, with a war to win and Nickel alloys diverted to more direct war uses, technical information and "know-how" become especially useful. Counsel, and printed data about the selection, fabrication and heat treatment of alloyed materials is available to you upon request.

New Catalog Index

New Catalog C makes it easy for you to get Nickel literature. It gives you capsule synopses of booklets and bulletins on a wide variety of subjects — from industrial applications to metallurgical data and working instructions. Why not send for your copy of Catalog C today?

★ *Nickel* ★

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York 5, N. Y.*



The Guns of Destiny

In unprecedented quantities, American ordnance builders are turning out the guns which will sound the death knell of Nazi Germany and Japan—better guns than the enemy can produce and far more of them.

It is our privilege to play a part in this production by furnishing large quantities of super-tough forgings for gun mount parts which must withstand unusual shocks and stresses. We are making forgings for tanks, tank destroyers, planes, ships, military vehicles and other essential fighting craft as well. Increasing production as rapidly as men and machines are available, we have kept faith with the industries we serve.

If you are making armaments or essential machinery, perhaps we can aid you in your forging requirements.

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Makers of Drop, Upset and Hammer Forgings for Ships, Guns, Planes, Tanks, Ordnance and Machine Tools
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Engineering Representatives in Principal Cities

Proudly we fly the Army and Navy "E" flag and stars, awarded and reawarded for excellence and proficiency in the production of war materiel.

Since every available ounce of Tungsten has been claimed for essential war use, and since the rule is that something else must be made to serve wherever possible, therefore very little could be helpfully said in recent months about the values of Tungsten. Yet Tungsten was never so important. We do well to remember that this standard alloying element has been withheld from some uses only because for other uses it is indispensable. And it is timely to note that the severest restrictions have now been a little relaxed. A better balance between need and supply has brought this about. When happily we all pass again from the economy of war to the economy of peace, unhampered use of Tungsten will be one of many advantages regained.

Inquiries concerning the availability or the metallurgical behavior of Tungsten, Molybdenum or Boron will be welcomed by the Molybdenum Corporation.

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American aircraft builders have, in an incredibly short time, created overwhelming air power through advanced design, flo-line production and the use of modern materials, among which magnesium is paramount.

The lowest of structural metals in specific gravity, yet possessing the highest strength-to-weight ratio, magnesium is truly the key to air power.

At the Howard foundry, an ever-increasing tonnage of magnesium castings is being produced for America's planes and other armaments.

The remarkable properties of magnesium, including its easy machinability, which are proving their worth in war, will be equally valuable in many peace-time products, a trend in which Howard Foundry Company's output will figure prominently.

At the other two Howard foundries, aluminum and bronze castings are being poured into fighting equipment of many kinds. Combined, these three foundries provide the largest nonferrous jobbing castings production in America.

When you need nonferrous castings, call on Howard. *For armament today—for utility tomorrow.*

HOWARD FOUNDRY CO.
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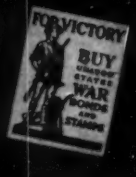
CASTINGS



Birth of an idea

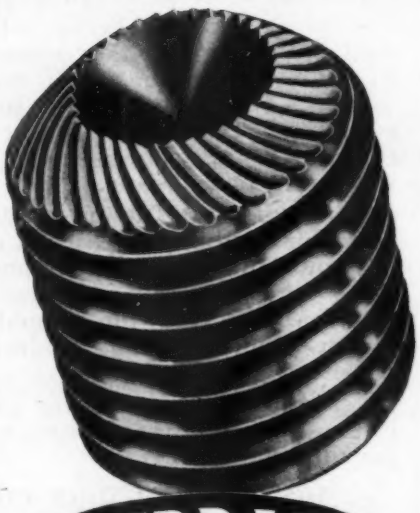
The idea of knurling the points of hollow set screws so they would not shake loose was originated by our President, Mr. Hallowell, to meet a need in our own plant.

One of our machinists had been having a great deal of trouble with set screws working loose on a machine, so every few days he had to tighten them up. This he mentioned to our President as he was passing through the shop and Mr. Hallowell, after some thought, suggested that he knurl the points of the screws and see what would happen.

About a month later the machinist was able to report that since the points had been knurled those screws had never worked loose.

We started production of the "Unbrako" Hollow Set Screws with Knurled Points shortly thereafter. Today, of course, they are in demand everywhere.

Play safe by specifying and adopting the "UNBRAKO" Knurled Point Locking Screws for all requirements



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STANDARD PRESSED STEEL CO.

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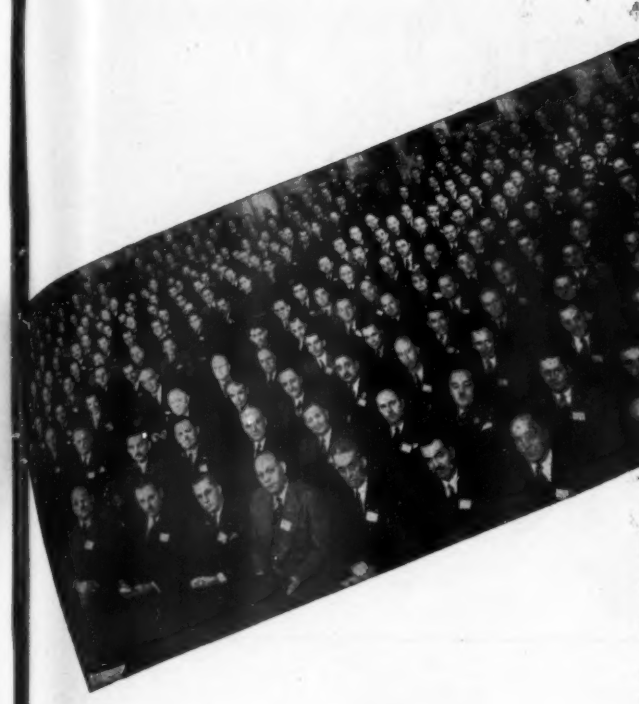

Need a little help on that metal problem of yours?

Want to speed up production of some particular war product, or see if you can save some metal somewhere along the production front?

Then come to Chicago the week of October 18 and attend the National Metal Congress and War Conference Display. Devoted to increased production of war products, to conservation of materials, and to post-war planning, this great event of the metal industry will help you solve many problems.

More than a hundred technical lectures will be presented by the four cooperating societies. Leaders in the metal industry and government will participate in the special War Production and Conservation Sessions held each day by the American Society for Metals, sponsor of the event.

We've a big production job still ahead of us. We need all the information and new developments that will improve the efficiency of armament production. So mark your calendar now — and plan to be in Chicago when the metal industry meets the week of October 18.

THE PALMER HOUSE
Chicago - October 18 thru 22

NATIONAL METAL CONGRESS *and* WAR CONFERENCE DISPLAY

● **Thousands of visitors to the Metal Congress will look to the hundreds of War Conference Displays for new products, new processes, and new developments. 65% of the available display space has been reserved in the first four weeks following announcement of this 25th Annual Conference Display.**

But excellent display room locations are still available. For complete information, write or wire the American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio. Phone: ENdicott 1910.

NATIONAL METAL CONGRESS AND WAR CONFERENCE DISPLAY

Under the direction of the American Society for Metals, in cooperation with the American Welding Society, the Wire Association, and the Institute of Metals and Iron and Steel divisions of the American Institute of Mining and Metallurgical Engineers.

DOES *One Part* GIVE YOUR WHOLE PLANT "INSPECTION JITTERS"?

DO inspection rejections of difficult precision parts put jitters of confusion into your production schedules? Do delays in producing such parts in your own plant, or troubles in having them made elsewhere, handicap the free flow of your assembly lines?

CAPACITY Immediately AVAILABLE for ball and roller BEARINGS Size 6" to 60"

Contact KAYDON

For precision in metal-working, Kaydon is organized to produce peculiarly difficult parts efficiently. By reason of long experience in extreme accuracy, plus advanced methods and equipment for production and inspection, the Kaydon organization is qualified to assure you of "delivery when needed" of parts made exactly as specified.

For excellence in production of extremely precise, unusually large ball and roller bearings.

THE KAYDON ENGINEERING CORP.

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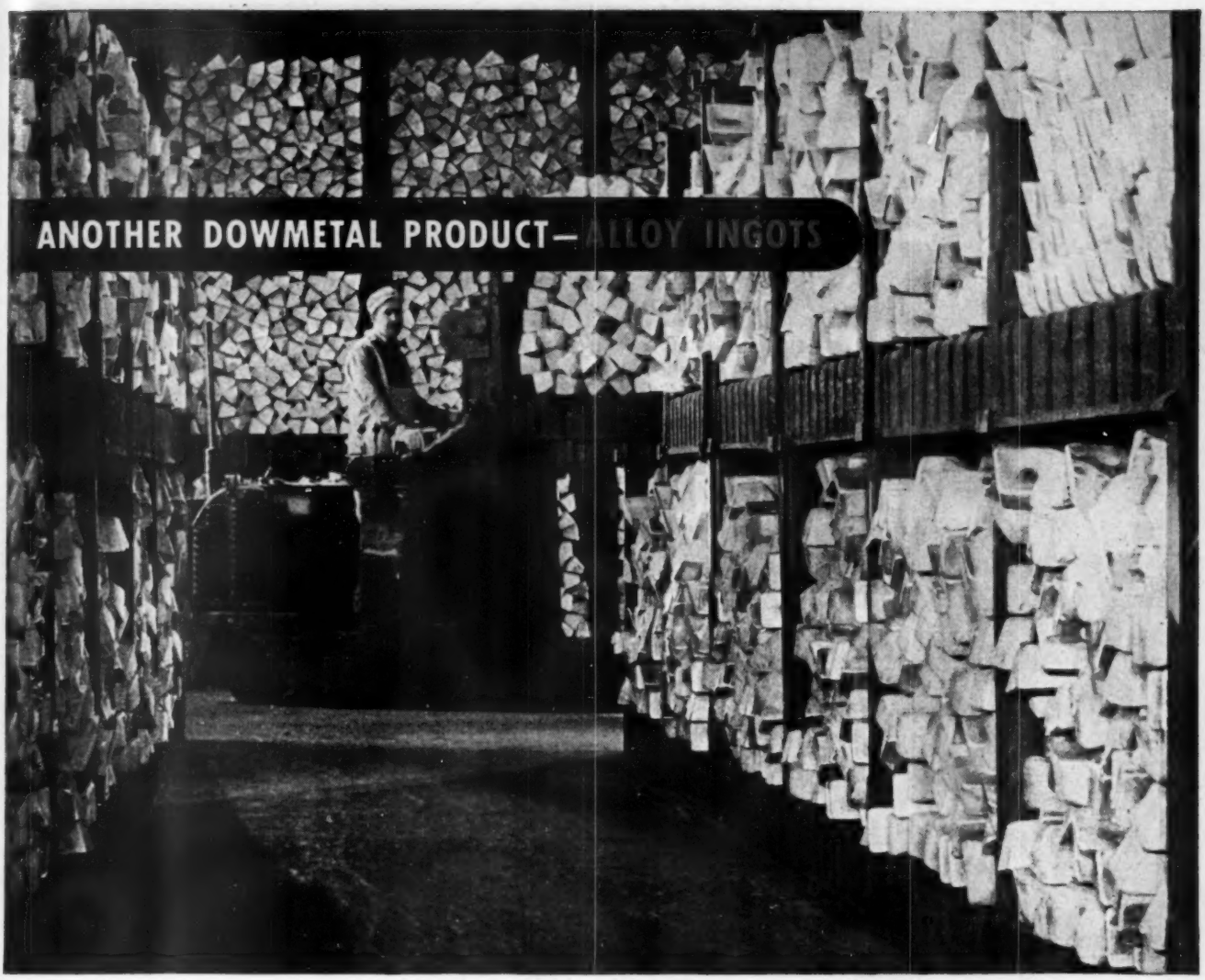
Specialists in Difficult Manufacturing



Answering the call for Magnesium Alloys

Twenty-seven years of research and experience go into every Dowmetal magnesium alloy ingot so that you who are entrusted to make vital sand, permanent mold and die castings can forget your alloy problems when you buy ingot from Dow.

All alloy ingots are made under close metallurgical control and furnished in a wide variety of compositions with certified analyses to meet strictest government and industry specifications. Dow also has available a complete line of fluxes and protective agents to meet your every melting problem.

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COLMONOY No. 4

HARD FACING ALLOY

RESISTS SEVERE WEAR IN DIESEL ENGINE VALVES

● Diesel engine valves, in locomotive service, must take a lot of punishment. Roadbed cinders and dust caused these valves to fail in service, wearing down rapidly and losing compression. To salvage the valves already on hand an undercut was made as shown in the illustration on the left.

COLMONOY No. 4 was applied in the undercut by oxy-acetylene welding, and subsequently machined and ground. Due to the low temperature at which the application was made there was absolutely no distortion in the valves.

Service records show that the great abrasion resistance of COLMONOY completely solved the problem of wear.

There is a grade of COLMONOY for every hard facing need. If you have a wear problem, COLMONOY engineers will be glad to make recommendations and suggest proper methods of application.

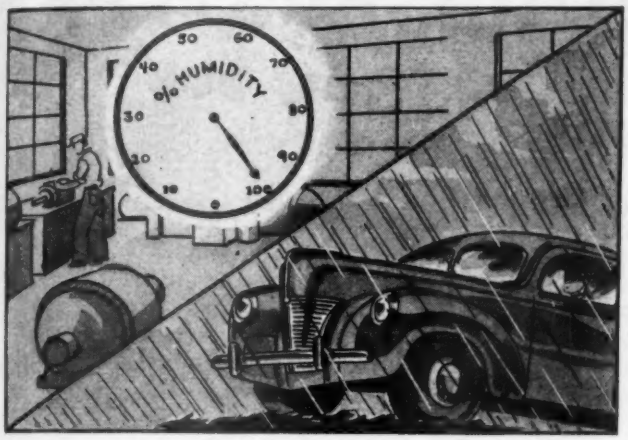
WALL-COLMONOY CORP.
720 Fisher Building, Detroit
Branch offices in New York City, Hasbell, N. Y., Chicago, Tulsa, Los Angeles and in Canada.

COLMONOY
HARD FACING ALLOYS AND OVERLAY METALS

WALL-COLMONOY CORPORATION—DETROIT

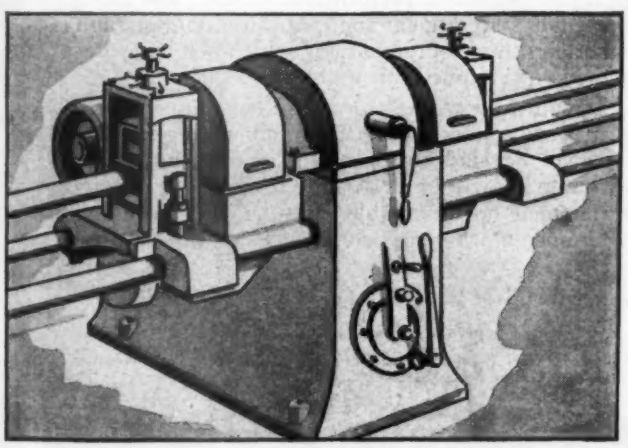
WHAT YOU CAN DO TO PROTECT YOUR MACHINERY'S OUTER SURFACE

HOW TO GUARD AGAINST RUST OR CORROSION



Anti-Corrode provides a safe, durable film that protects metal against ravages of weather and other conditions that normally cause rust or corrosion. It can be removed easily with gasolene or kerosene.

To help guard against such dangers, Cities Service has developed an efficient, new corrosion preventive—ANTI-CORRODE . . . a reliable—easily applied—safeguard for raw stocks, finished parts or complete machines.



Today, with machinery practically worth its weight in gold—it will pay you to protect the *outside* as well as to lubricate the *inside* of all your mechanical equipment. Even machines that are in daily operation in your plant, as well as those that may be idle, can be attacked—and severely damaged—by rust or corrosion.

CITIES SERVICE OIL COMPANY

Sixty Wall Tower, Room 1740
New York 5, New York.

Gentlemen:

Please send me a FREE sample of Anti-Corrode.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

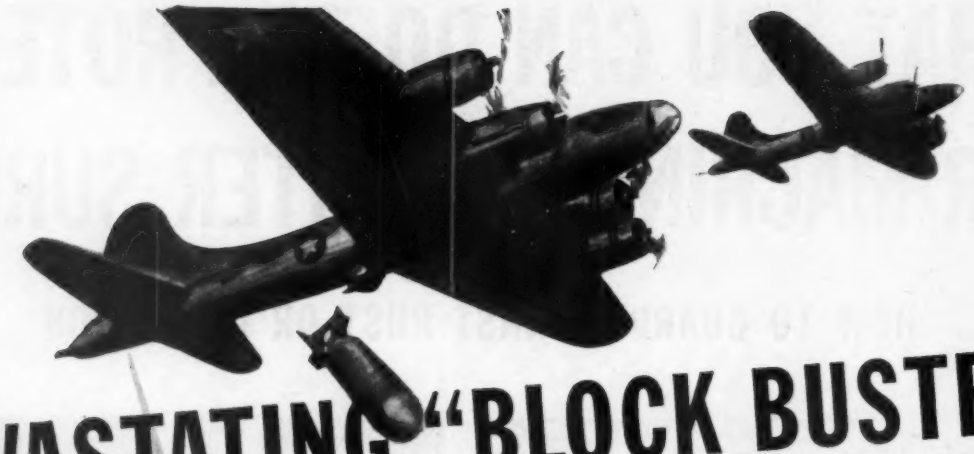
Send the above coupon today for a generous supply of Anti-Corrode for demonstration on your own equipment. No charge or obligation, of course!

OIL IS AMMUNITION — USE IT WISELY!

IT'S NOT A GIFT—
IT'S THRIFT!

BUY WAR BONDS

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO
ARKANSAS FUEL OIL COMPANY



A DEVASTATING "BLOCK BUSTER"

OR JUST A TWO-TON DUD?

SPRINGS make the difference. When one of these packaged earthquakes is released on a high level raid, the springs in the bomb-arming mechanism *must* function properly—even at temperatures of 60 below. Otherwise, the bomb's terrific potential for destruction and all the cost, risks and planning involved in placing it on the target have gone to waste.

Our spring engineers have done their vital part in seeing that "Block Busters" make more than a hole in the pavement. These bombs are made "ready for business" by springs especially designed to operate regardless of extremes of temperature, weather and atmosphere.

The same high standard of spring engineering is behind the reliable performance of the tank guns, torpedoes, aircraft cannon, anti-aircraft guns and other fighting equipment for which we have designed and supplied springs by the millions.

If you need springs to meet the tough requirements of ordnance application, our spring specialists will be glad to assist you. You'll find their intimate knowledge, not only of springs but of wartime steels now available, very helpful in solving your spring problems economically and promptly.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

U·S·S American Quality Springs

UNITED STATES STEEL

Saves Machining Time

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Greater Accuracy, Uniformity in Wall Thickness and Width Dimensions

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Many Finishing Operations Entirely Eliminated

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Closer Tolerances

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Reduced Costs

25 YEARS' EXPERIENCE IN WELDED RINGS AND BANDS

Our complete facilities, experience and equipment are available to any user of rings and bands. Let us show you how it will be to your advantage to use American WELDED Rings, Bands and Ring Assemblies in diameters from 4½ inches to 8 feet.

Send for folder, "Welded Rings and Bands".

STEEL PRODUCTS FABRICATED BY RESISTANCE, SPOT, ARC OR GAS WELDING

THE AMERICAN WELDING & MANUFACTURING CO. • Warren, Ohio

BRANCH OFFICES IN PRINCIPAL CITIES

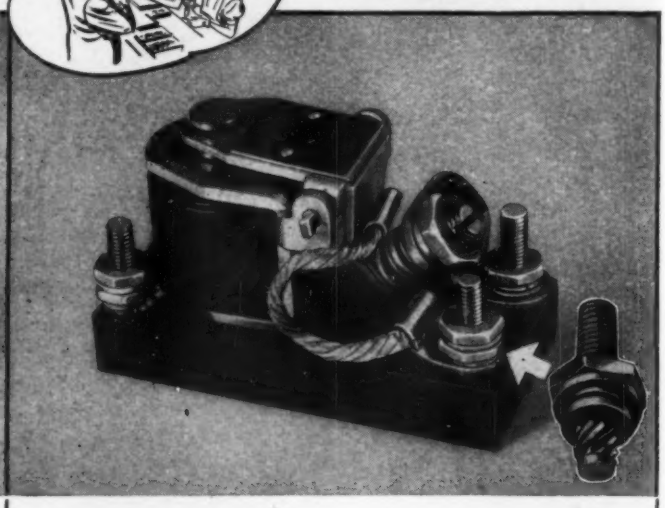
Question every fastening job

...at the DRAFTING BOARD!

GENERAL RADIO COMPANY design engineers saved a lot of production work and money by giving a little extra thought to fastening methods. They might have written the common specification – "machine screws in threaded brass inserts" – to fasten the metal dial to the Bakelite knob of their Variac Transformer. That would have meant extra expense for inserts ... extra work and time in molding knobs.

But they considered the P-K Self-tapping Screw method, too ... found that stronger fastenings could be made with ONE simple operation, without inserts. And they solved the problem of making fastenings to some knobs that did not allow room for inserts.

...at the PRODUCTION LINE!



STRUTHERS-DUNN production men considered P-K Self-tapping Screws as a possible means of simplifying a complicated job of attaching terminals to the Dunco Relay. With a machine screw, the fastening required 5 operations ... drilling through the plastic base ... drilling a recess in the bottom of the base for the screw head ... inserting the screw from the bottom ... filling the recess with wax ... and finally, locking the screw in place.

The job became a cinch, with a special screw that combined a Type "U" Self-tapping Screw on one end and a standard machine screw on the other end. The screw is simply driven into a hole drilled into the top of the base ... the Self-tapping Screw threaded section anchoring securely into the plastic base. One operation instead of five!

Hundreds of Jobs Prove You Can Save Man-Hours

... with Parker-Kalon Self-tapping Screws

These are two of hundreds of products, important to the war effort, which are being turned out faster, with a saving of precious man-hours, because the makers questioned their fastening methods.

"Can it be done with P-K Self-tapping Screws?" ... is a question that uncovers opportunities to save time and labor. It is a wise standard practise at the drafting board, and on the production line. For a very large percentage of metal and plastic fastening jobs, these Screws offer a combination of ease, speed and security that no other fastening device or method can match.

Call in a P-K Assembly Engineer to check over fastening jobs with you. Whenever he finds a place for a Self-tapping Screw you can make the fastening in one easy operation ... just drive the Screw into a plain hole! Without interrupting production, without special tools or skilled help, you eliminate tapping and tap maintenance ... stop fumbling with bolts and nuts ... do away with inserts ... cut out riveting and welding in hard-to-get-at-places. Write for a P-K Assembly Engineer, or, send assembly details for recommendations. Parker-Kalon Corp., 194-196 Varick Street, New York.

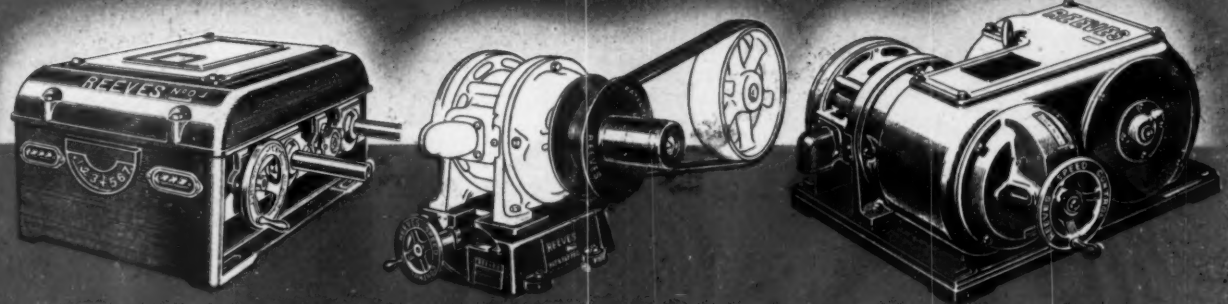
SELF TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON

Quality-Controlled

SELF-TAPPING SCREWS

MANPOWER BOOSTERS...



VARIABLE SPEED TRANSMISSION for providing infinite, accurate speed flexibility over wide range.

VARI-SPEED MOTOR PULLEY converts any standard constant speed motor to a variable speed drive.

MOTODRIVE combines motor, speed varying mechanism and reduction gears in single unit.

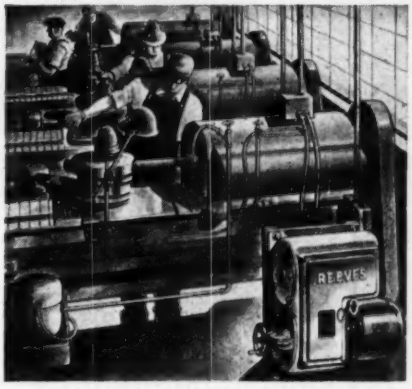
Manpower problems are perplexing you today as never before. Machine operators must be recruited from the ranks of women and from "white collar" men.

Anything that helps these workers get the hang of their new jobs faster, contributes vitally to our war program. REEVES Variable Speed Drives do this by enabling operators to adjust machine speeds to their own skills, to different sizes and kinds of parts and materials, quickly and accurately without stopping the machine.

REEVES Speed Control also insures greater precision and enables skilled operators to turn out more work—in many instances doubles productive capacities of men and machines.

Many Designs and Models

The three basic REEVES units shown above are made in a wide range of designs and sizes. One of these units can be quickly installed on any type or make of production machine to provide "stepless" speed adjustability. Full description of REEVES units and their use in more than 25,000 plants throughout industry is contained in 124-page Catalog-Manual A-419. Send for it.



GUN PART PRODUCTION INCREASED 25%

—in this Detroit machine shop, without extra machines, extra labor or extra floor space—when REEVES Variable Speed Drives were installed.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

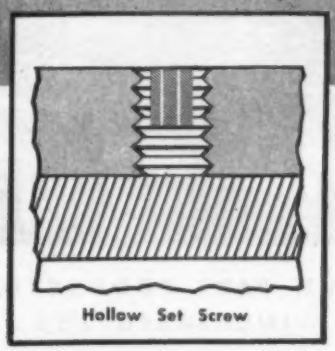
REEVES *Accurate Variable* SPEED CONTROL

J. K. SMIT & SONS

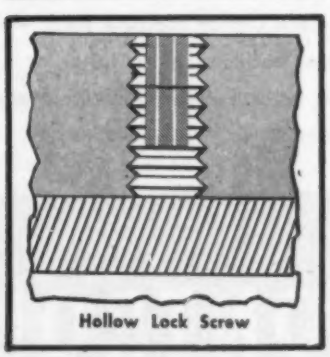
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

INDUSTRIAL DIAMOND TOOLS

DESIGNED FOR Safety . . . BUILT FOR Strength



Hollow Set Screw

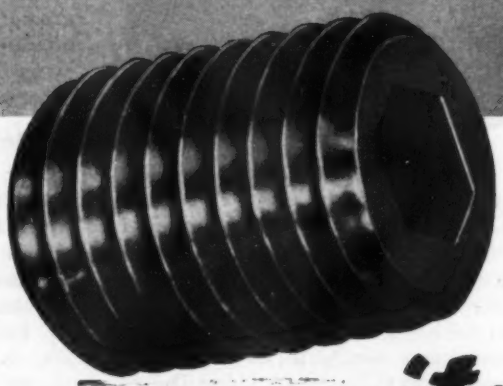


Hollow Lock Screw

The advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.

Mac-it Hollow Set Screws offer these design features, plus great strength. They are heat-treated to resist upsetting of the point, rounding out of the hex sockets, and splitting of sockets at the corners.

The tremendous holding power of Mac-it Hollow Set Screws makes locking devices unnecessary in all but a few applications. In these cases, Mac-it Hollow Lock Screws are used like jam nuts to prevent any possibility of loosening.



Mac-its

PRONOUNCED "MACK-IT"

OTHER MAC-IT PRODUCTS INCLUDE:

Socket head cap screws, Stripper Bolts, Hollow pipe plugs, Hexagon head cap screws, Square head set screws

4341

Strong, Carlisle & Hammond Co. · Cleveland, Ohio

Utilization of electrical horsepower is an accurate gauge to progress, both industrial and social. American industry used 33,844,131 h.p. in 1929, jumped to 45,291,319 in 1939, and, since 1939, has gained more than any other two countries in the world. For the past 27 years, Howell Motors have supplied an ever-increasing amount of horsepower for American industries. Today, Howells are serving every important industry in America.

HORSEPOWER

BY HOWELL - FOR YOUR INDUSTRY

You're looking at the electric motor that has won a high place in American industry for dependability, quiet operation and honest value.

It is a precision-built motor throughout.

In wartime production, where time is precious and delays are disastrous, here is another feature of Howell Motors you cannot afford to overlook:

You can load them with full confidence in their ability to stand up under the toughest jobs you can assign within the limits of safety.

Now that the War Production Board requires you to use electric motors of the lowest possible horsepower you are safe in specifying horsepower by Howell.

Let Howell engineers aid you in selecting the proper rated motors for your requirements and obtain this safety factor which is so vital in these times.

HOWELL ELECTRIC MOTORS COMPANY

HOWELL, MICHIGAN

Manufacturers of Quality Motors Since 1915

The **HOWELL IDEA** in Electric Motors *precision-built*

...there's an easier way to end your motor problems

ask Westinghouse!

Maybe the *one best motor for your* job has to be designed . . . maybe modification or selection of an existing type will do the trick. Either way, there's no substitute for "know-how" in designing, modifying or selecting it. Westinghouse puts 57 years of motor and control experience at your disposal to get the right answer sooner. For engineering aid, phone or write your nearest Westinghouse office.

J-21288

Westinghouse

MOTORS AND CONTROL

DUE TO WAREHOUSE SERVICE!

A tank factory needed steel shafts in fifteen days! Bissett accepted this order . . . and beat the promise. To us, the war is no excuse for curtailed service, but a mighty challenge to our facilities for increased service. Perhaps a similar problem in your plant can be solved by Bissett engineers.

BUY WAR BONDS !

NORMALLY CARRIED IN STOCK

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Tool Bits • Shim Steels • Tool Steels • Tool Steel Tubing • Boiler Tubing

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DIRECT MILL REPRESENTATIVES SINCE 1920

IF YOU HAVE A VIBRATION PROBLEM . . .

Originally developed for use in aviation, where loose fastenings can not be permitted in spite of severest vibration, Boots Self-Locking Nuts provide a simple solution *wherever* there is a fastening problem. Boots Nuts *can't* work loose.

One-piece, all metal, Boots have these important advantages over other nuts:

1. Greater re-usability in maintenance.
2. Proof against corrosive action of oil, water, or chemicals.
3. Resistance to high temperature.

Boots Nuts meet exacting specifications of all government aviation agencies.

There's a BOOTS NUT for every application

ROL-TOP BOOTS ANCHOR

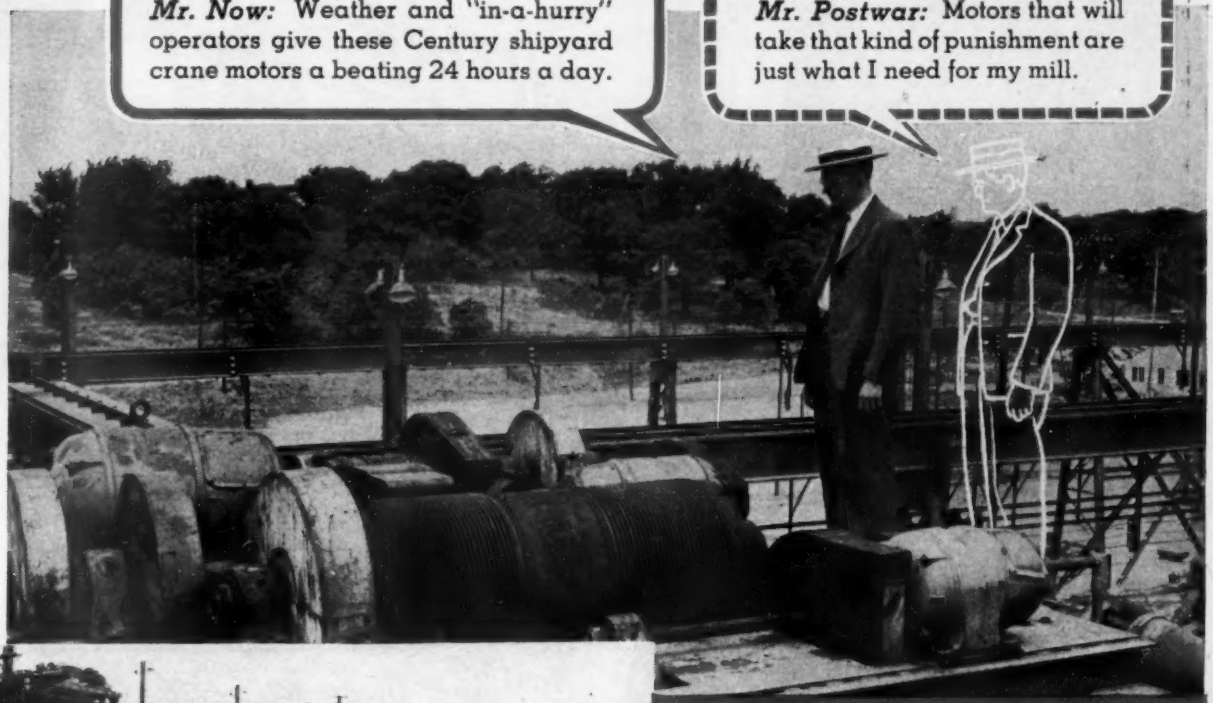
BOOTS AIRCRAFT NUT CORPORATION

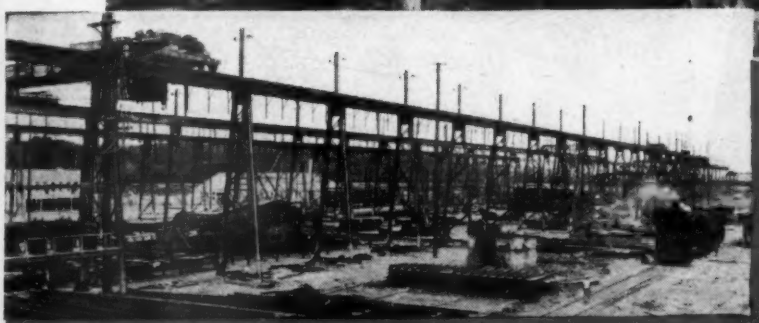
GENERAL OFFICES, NEW CANAAN, CONNECTICUT

Take a Look at TOMORROW– *Today!*

Mr. Now: Weather and "in-a-hurry" operators give these Century shipyard crane motors a beating 24 hours a day.

Mr. Postwar: Motors that will take that kind of punishment are just what I need for my mill.





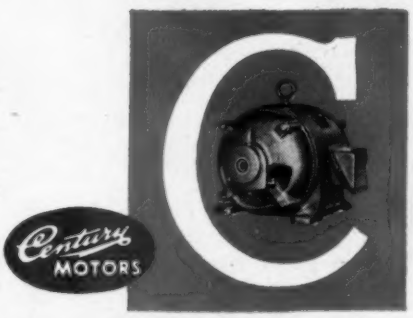
SUN, RAIN, SNOW,

and the torturing frequent starting and reversing of impact loads prove the stamina of

CENTURY
CRANE MOTORS

Here's a motor job that demands real stamina, 24 hours a day. In a well-known shipyard, Century Motors are installed on each of the cranes and hoists like that shown above. Exposed to the elements day and night, they stand up under the shock loads, frequent starts and stops and reverses imposed by the high speed, modern shipbuilding war program.

You can depend on Century today — and tomorrow.



One of the Largest EXCLUSIVE Motor & Generator Manufacturers in the World.

CENTURY ELECTRIC COMPANY
1806 Pine Street St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

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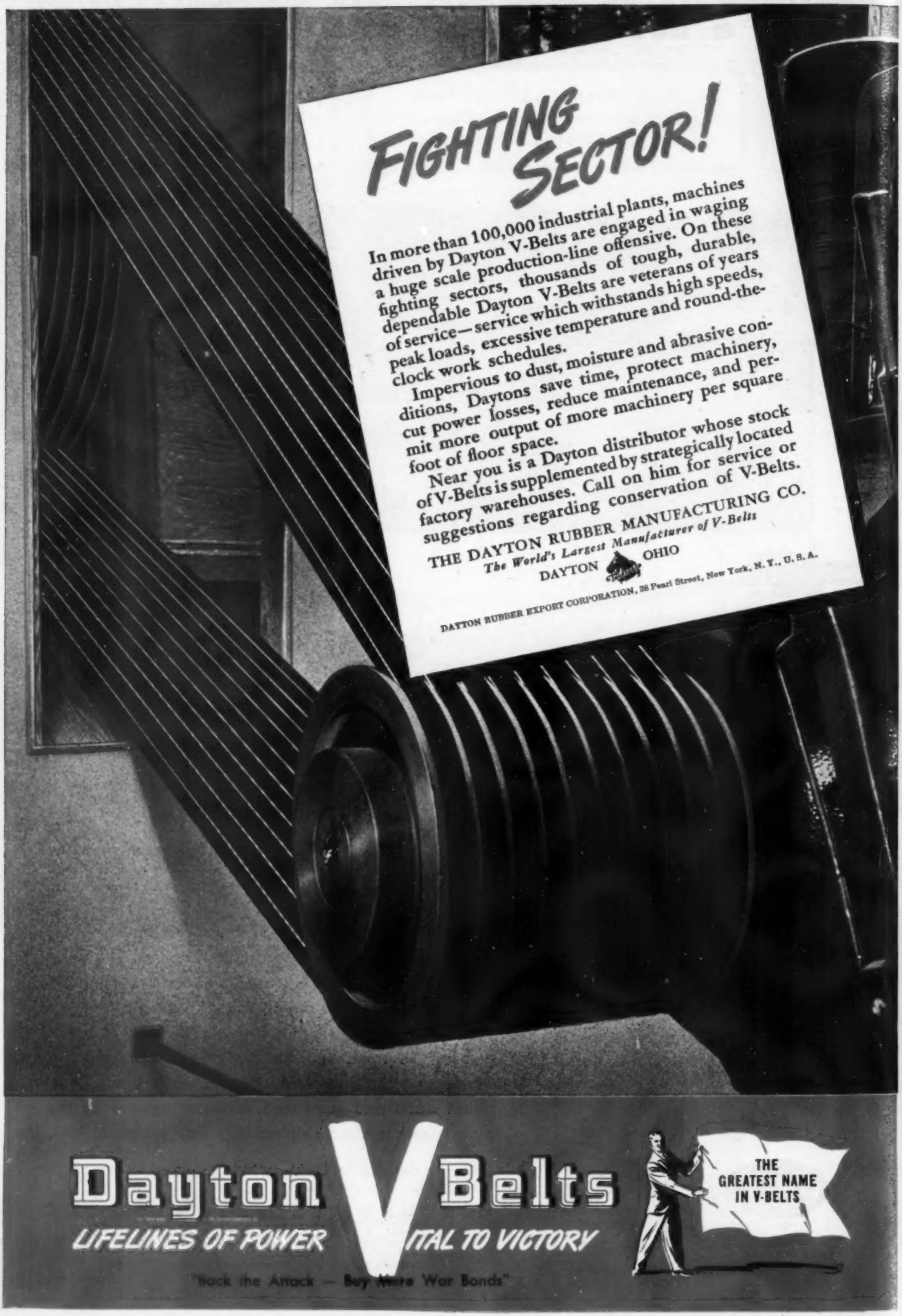

FIGHTING SECTOR!
In more than 100,000 industrial plants, machines driven by Dayton V-Belts are engaged in waging a huge scale production-line offensive. On these fighting sectors, thousands of tough, durable, dependable Dayton V-Belts are veterans of years of service—service which withstands high speeds, peak loads, excessive temperature and round-the-clock work schedules.
Impervious to dust, moisture and abrasive conditions, Daytons save time, protect machinery, cut power losses, reduce maintenance, and permit more output of more machinery per square foot of floor space.
Near you is a Dayton distributor whose stock of V-Belts is supplemented by strategically located factory warehouses. Call on him for service or suggestions regarding conservation of V-Belts.
THE DAYTON RUBBER MANUFACTURING CO.
The World's Largest Manufacturer of V-Belts
DAYTON OHIO
DAYTON RUBBER EXPORT CORPORATION, 38 Pearl Street, New York, N. Y., U. S. A.
Dayton V Belts
LIFELINES OF POWER VITAL TO VICTORY
"Back the Attack — Buy More War Bonds"
THE GREATEST NAME IN V-BELTS

Here's the answer
to Your Limit Switch Problems

Bulletin 801-2
Complete Line
of Limit Switches

The Allen-Bradley 24-page Bulletin 801-2 is a comprehensive engineering handbook on limit switches and their applications. Every engineer who uses electric controls will find this bulletin a valuable and convenient reference manual. It is full of new ideas . . . new solutions . . . new devices. Write today.

ALLEN-BRADLEY

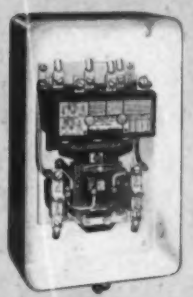
BULLETIN 801-2 LIMIT SWITCHES

QUALITY

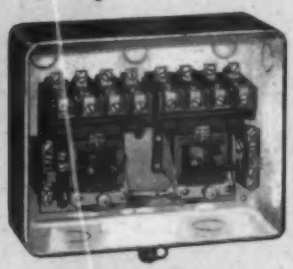
Trouble-Free STARTERS for THREE-SHIFT OPERATION

These solenoid motor controls . . . developed by Allen-Bradley . . . need no contact maintenance. They have only one moving part. There are no bearings . . . no pins . . . no pivots . . . no hinges to gum up and stick . . . no production delays from starter troubles when you standardize on Allen-Bradley solenoid motor control. Write today for "The Story of the Solenoid Starter." Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wis.

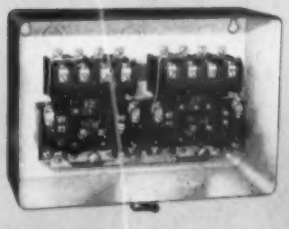
Solenoid Type Relays. These relays provide reliable and consistent sequence interlocking control for machine tool operations such as drilling, tapping, boring, milling, and grinding.



Across-the-line Starters. The simplest starters for a-c motors! They have only one moving part, the solenoid plunger with the double break, silver alloy contacts.



Reversing Switches. Used for across-the-line starting and reversing. They are mechanically interlocked so both contacts cannot be closed at the same time.



Multi-Speed Across-the-line Starters. Provide remote control for two, three, or four speed squirrel-cage motors used on machine tools, compressors, refrigerating, air conditioning, and many other applications.

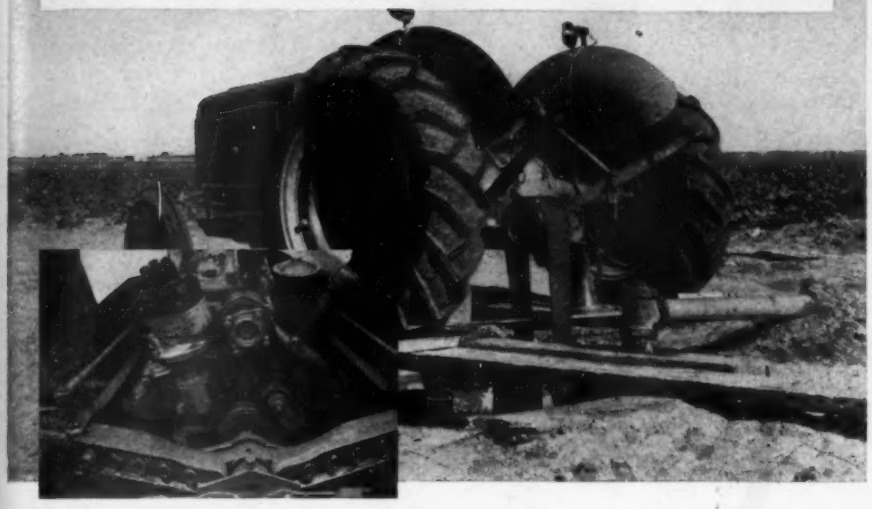
A-B Quality

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

ENCLOSURES

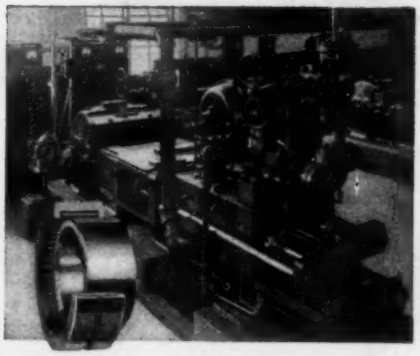
General Purpose | Corrosion-Proof | Water-Tight | Non-Haz. Dusts | Hazardous Dusts | Corrosive Gases | Non-Cor. Gases | Wall Mounting | Pedestal Mounting

IN THE NEWS
WITH TORRINGTON—BANTAM

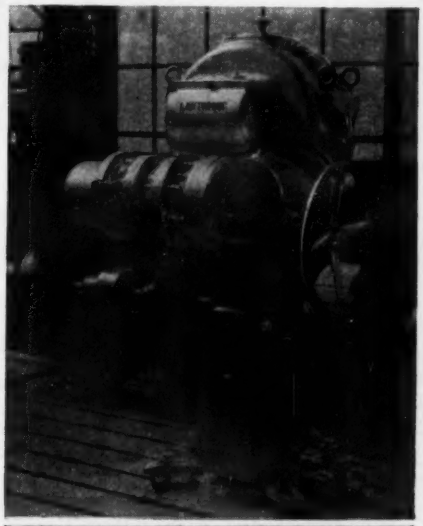


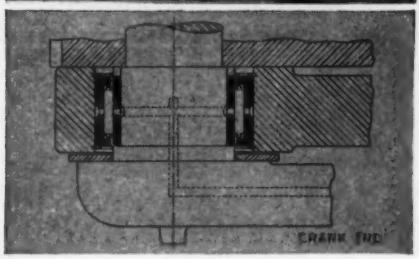
PUMPING WATER FOR IRRIGATION is just another job to the versatile Ford-Ferguson Tractor produced by Harry Ferguson, Inc. So that the fan will spin at its normal cooling rate, an "idler pulley" provides a ready adjustment for fan belt tension. Because of their high load capacity, efficient lubrication and low coefficient of friction, NCS Needle Bearings have been employed on the "idler pulley "for this frequently long-sustained job of "idler pulley" operation.

UTMOST PRECISION is required in the manufacture of .30 caliber Johnson Light Machine Guns. To produce these modern weapons of war, Johnson Automatics, Incorporated uses special precision equipment in which Needle Bearings are installed. These Needle Bearings were selected because of their unusually high unit capacity and ready adaptability to many machine tool operations.



WARTIME OUTPUT OF PLASTIC MATERIALS is aided by these large pumps built by the Worthington Pump and Machinery Corporation. Here again heavy-duty NCS Needle Bearings in the wrist pins contribute to the high operating efficiency of these pumps, which are designed for a flow of 70 GPM pumped at 2000 pounds working pressure.





HIGH LOAD CAPACITY AND SMALL SIZE, which permit the use of smaller stressed parts than would otherwise be possible, are reasons given by Philadelphia Gear Works, Inc. for the application of NCS Needle Bearings in these valve controls. Used on the crank pins, these unusual anti-friction bearings permit the use of a one-piece, rather than a split connecting rod.

A COMPLETE LINE of needle and standard anti-friction bearings—all types, for all purposes—is available from Torrington-Bantam, as well as special types and custom-designed bearings for new and unusual applications. In addition, the unbiased counsel of engineers experienced in the selection and design of bearings for every requirement is offered by Torrington-Bantam without obligation to help you meet both today's and tomorrow's needs. For assistance in the solution of *your* bearing problems, TURN TO TORRINGTON.

ARMY E NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER · TAPERED ROLLER · NEEDLE · BALL

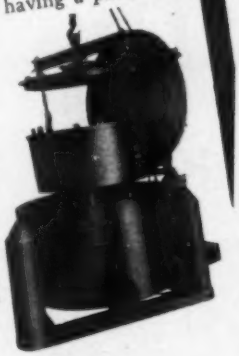
THE TORRINGTON COMPANY · BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA

Stop throwing away CUTTING OIL!

Now is the time to conserve cutting oil hidden in your chips. Tolhurst Chip Wringers recover as much as 98.6% of this valuable oil through the application of centrifugal force only. Routine is simple. Unskilled help can operate Tolhurst Chip Wringers.

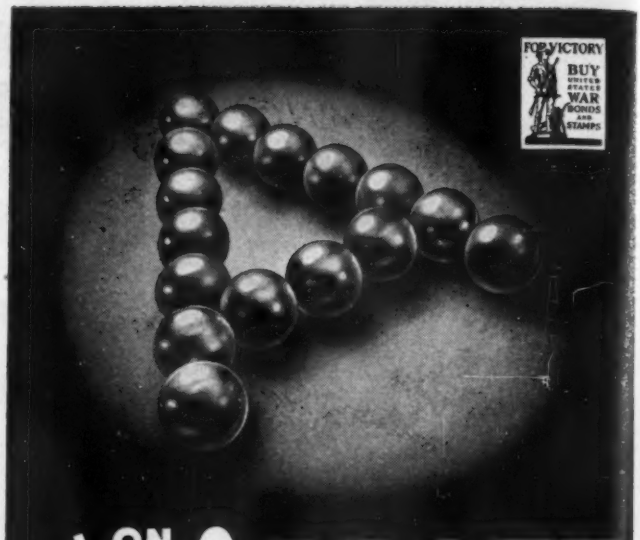
REDUCE TOOL WEAR — The effect of having a plentiful daily supply of reclaimed oil results in a more generous and conscientious use of cutting oil . . . customer tool room records show that tool wear is often reduced as much as 50% after Tolhurst Chip Wringers are put into action. Investigate Tolhurst Chip Wringers for conserving cutting oil and reducing tool wear. Details on request.



Division of American Machine and Metals, Inc., East Moline, Illinois

ARMY E NAVY

TOLHURST CHIP WRINGERS



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SOMETHING EXTRA — assure it in your product assemblies with the STAMINA provided by ABBOTT BEARING BALLS.

Delivery estimates gladly given.

THE ABBOTT BALL COMPANY HARTFORD, CONN. U.S.A.

SHIPPED AT PEACE-TIME SPEED

GILBARCO COOLANT PUMPS are made by one of the country's largest pump manufacturers for all machine operations. Rugged and durable, they are built for 24 hours a day service.

STANDARD MOTORS Pumps with motors for all regular voltages and cycles, two or three phase, shipped promptly.

SPECIAL MOTORS Facilities for winding motors for unusual electrical characteristics enable us to ship almost as promptly as standard units.

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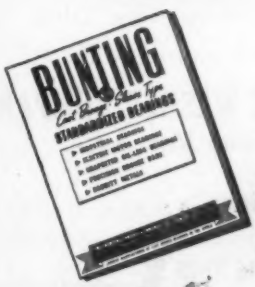
WEST SPRINGFIELD, MASS.

For Machines That Make Machines That Fight

● Bunting Bronze is serving today in aircraft tanks, cannon, fighting ships and mobile units of the Army and Navy, and also in the amazing machines that make machines that fight. Bunting engineers are working with the pioneers in this new mechanical age.

Time, labor, and critical materials are saved by the use of Bunting Bronze Standardized Bearings available from stock, completely machined, for applications in machine tools, electric motors and industrial equipment of all kinds. Bunting Factory-Finished Precision Bearing Bronze Bars save 50% of machining time and 25% of purchased metal. Ask your wholesaler. Write for catalog . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in Principal Cities.



Bunting

BRONZE BUSHINGS • BEARINGS • PRECISION BRONZE BARS

Dare We Speak of Peace?

Yes—because it means so much to all of us individually. With it will come again those products of industry like the car, the radio and the refrigerator, which never were luxuries so much as necessities. And those who are thinking in post-war terms are asked to remember that Weatherhead will be prepared to help build these products again as well as the many strange new ones that are destined to emerge from this war.

Look Ahead with

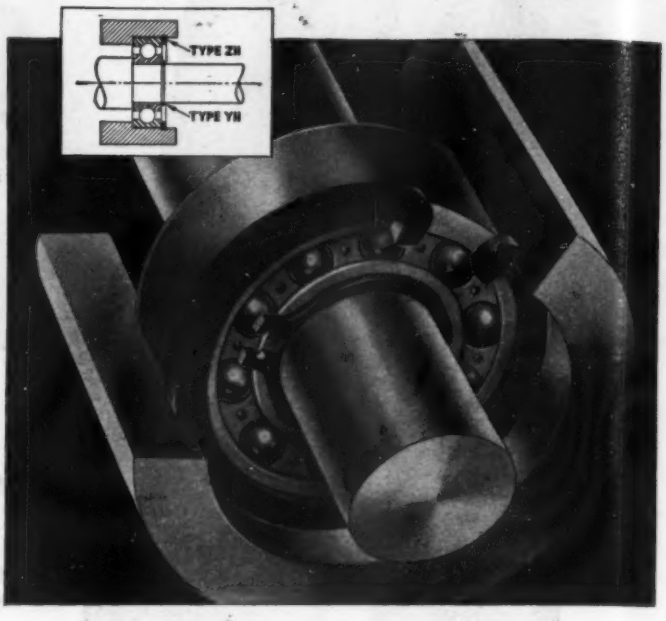
Weatherhead

THE WEATHERHEAD CO., CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles, Canada—St. Thomas, Ontario

SMART DESIGNING COULD SAVE MONEY FOR YOU, TOO



These efficient, yet inexpensive artificial shoulders save metal as well as money.

National retaining rings are being used for more and more new applications these days when every ounce of metal and every cent of cost are so important.

Every shoulder or collar on your machines or on your metal products should be examined to see how much savings you can effect by using retaining rings.

It's expensive to hold a mechanism in place with unnecessarily big shoulders or collars,—or to temporize with small cotter pins, etc. Let us show you how spring steel retaining rings can do a thoroughly efficient job for you.

Write today for our descriptive folder on Retaining Rings.

THE NATIONAL LOCK WASHER COMPANY
Newark, N. J., Milwaukee, Wisc., U. S. A.

WORTHINGTON

QUICK DETACHABLE QD SHEAVES

Installing a 48" PD "C" section 8 groove QD Sheave on a 7" stroke horizontal air compressor. The QD Sheave weighs 440 pounds, four times the girl's weight.

NOW AVAILABLE for DriveN as well as DriveR applications

Women assembling GIANT DRIVEN SHEAVES, no longer are an oddity to be headlined in Ripley's "Believe It Or Not." INEXPERIENCED "GREEN" HELP in assembly plants find these sheaves simple to mount.

The problems of assembling and maintaining Vital DriveN and DriveR machinery have been greatly simplified with the introduction of the Worthington patented QD Sheave with its "Easy To Get On—Easy To Get Off, YET ALWAYS TIGHT ON THE SHAFT" features.

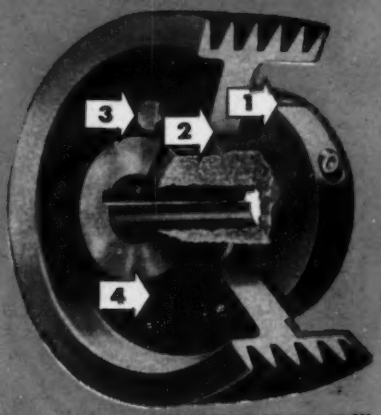
The QD Sheave design has now been incorporated into a complete range of DriveN and DriveR sizes that will accommodate 10,000 drive combinations up to 150 horsepower from stock.

One demonstration will convince you that a wrench and inexperienced hands are all that are needed to install or remove a QD Sheave, regardless of size. Arrange for your demonstration today—write or call the Worthington Multi-V-Drive dealer or the Worthington District Office in your territory.

MEMBER V BELT ASS'N

MV3-10

Superior Advantages of the QD Sheave Design Cost No More



WORTHINGTON U.S. PAT. NO. 2,320,961

1 Split Hub for easy mounting or removal from the shaft.

2 Tapered Fit between split hub and rim for easy mounting or removal of rim from hub.

3 Pull-up Bolts which hold the rim onto tapered split hub for tapered friction drive assembly and positive press fit on the shaft.

4 Tapped holes in rim for using pull-up bolts as jack screws to free the tapered friction fit when detaching the rim.

Mail the Coupon NOW for this New Bulletin

I would like more information about the Time, Labor, and Material Saving Advantages of the Worthington QD Sheave.

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Company _____

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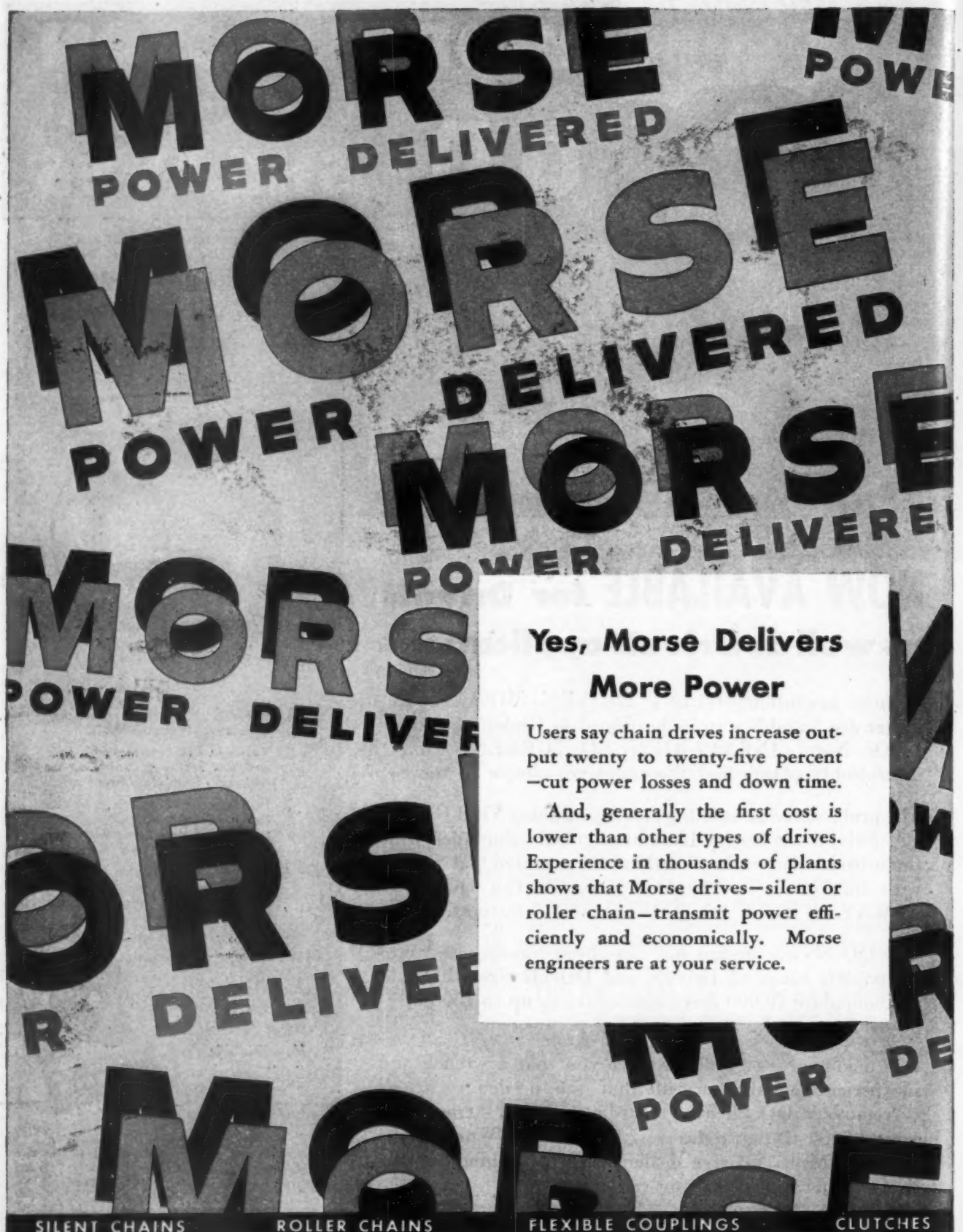
Product Manufactured _____

COMPLETE DRIVES **WORTHINGTON MULTI-V-DRIVES** SHEAVES OR BELTS ONLY

WORTHINGTON PUMP & MACHINERY CORPORATION - GENERAL OFFICES: HARRISON, N. J.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WANT LONGER BEARING LIFE?

Want Less Down Time?

SIMPLIFY Load Stresses *the* ROLLWAY *Right-Angle Way*

By carrying every load—both radial and thrust—at right angles to the roller axis, Rollway's solid cylindrical roller bearings automatically split the load into the two fundamental components of *pure* radial and *pure* thrust. That reduces the load stresses per roller and per bearing. It eliminates all compound loads, and all oblique resultants. You get more accurate engineering of the bearing to the job. You get a bearing which lasts longer under heavier loads and continuous running. Downtime for maintenance and replacement is substantially reduced.

Follow this

BASIC BEARING PRINCIPLE

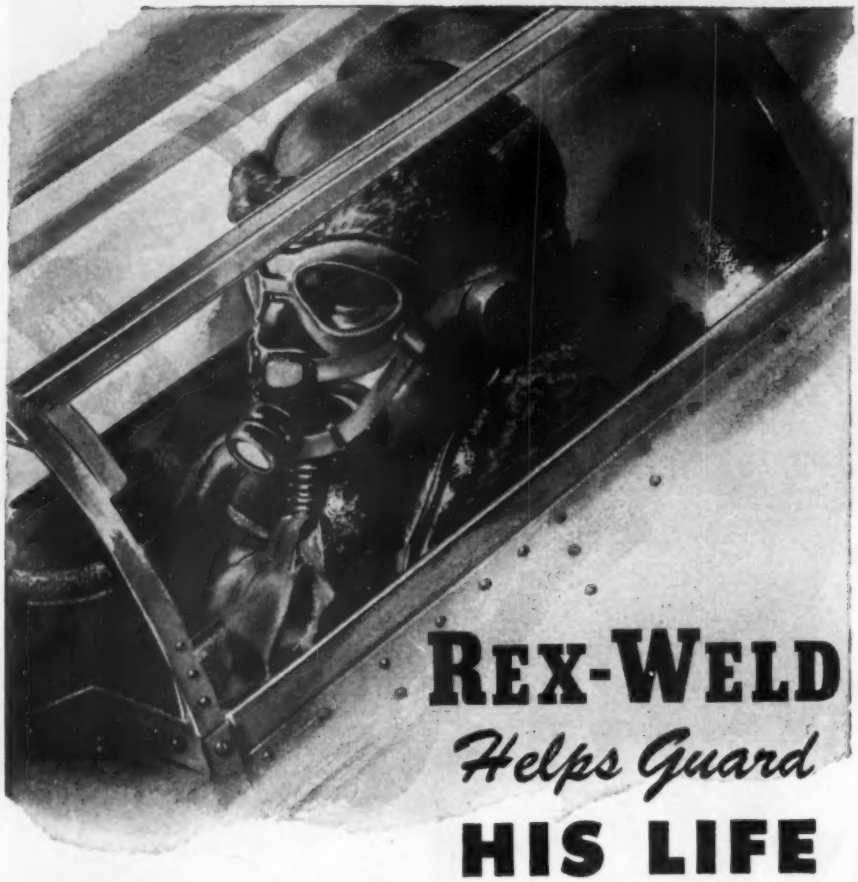
- **Carry all radial loads at right angles to the roller axis.**
- **Carry all thrust loads at right angles to the roller axis.**

Standard Sizes for Most Applications

Rollway has developed a large list of types of solid cylindrical roller bearings in both SAE and American Standard metric sizes, each having definite characteristics to meet exacting needs. Take full advantage of this wide choice of types and sizes. Let Rollway's specialized bearing experience help you in your choice. Just send a sketch or detailed description of your machine design or bearing problem. A confidential bearing analysis and recommendation will be returned to you without cost or obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

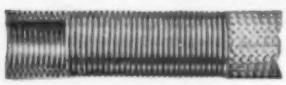


REX-WELD *Helps Guard* HIS LIFE

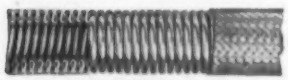
REX-WELD Flexible Metal Hose has met the critical test that demands only the best materials for our combat planes. More and more bombers, fighters and interceptor-pursuit ships are being Rex-Weld equipped.

REX-WELD's war service is not confined to the planes themselves. In the steel mills and munition factories, on the production and assembly lines, everywhere that war-worthy flexible connections are needed, REX-WELD is rendering vital service.

There are specific reasons for this. REX-WELD is a specially constructed flexible metal tubing. It is fabricated from strip metal by a precision autogenous welding process that produces uniform, stronger wall structure plus extreme flexibility. REX-WELD stands up under high pressures, high and low temperatures, extreme contraction and expansion. It is seep-proof to gas, water, oil, air and searching fluids.



Type RW-81
(annular corrugations)



Type RW-91
(helical corrugations)

Available in continuous lengths to 50 ft. Both Steel and Bronze. 3/16" I. D. to 4" I. D. inc. Pressures to 14,500 p.s.i. Temperatures to 1000° F.

Write for Engineering Recommendations

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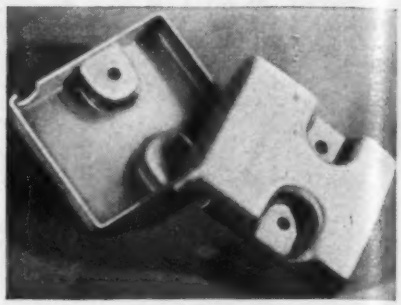
General Offices: MAYWOOD, ILLINOIS

Factories: Maywood and Elgin, Illinois

PRECISION PARTS

"STAMPINGS" ON THE TOES OF THE AXIS



. . . "ten times faster" . . .

Armed jeeps that race around the battlefields are the toughest little bits of dynamite that it is possible for the world's greatest automobile manufacturers to produce.

These small parts illustrated are one of the contributions of ACE to their fast, sturdy construction. Originally designed as a casting, the metal stamping department of ACE is now turning them out ten times faster, and conserving a lot of valuable metal in the bargain. The problem was to compensate for the different draws in the blank development so that the bottom of the piece comes flat.

How to hold a piece to closer tolerances, how to deliver it in large quantities on a mass production basis—that's typical of the problems that the ingenuity and modern machinery of ACE are constantly solving.

If you are looking for a source of supply for small parts or assemblies which call for stamping, machining, heat-treating, or grinding, ACE still has some capacity available from time to time. Send us a sample, sketch, or blueprint for quotation.

Ace Manufacturing Corporation Offers the Services of—
A COMPLETELY EQUIPPED AND HIGHLY SKILLED
HEAT-TREATING DEPARTMENT

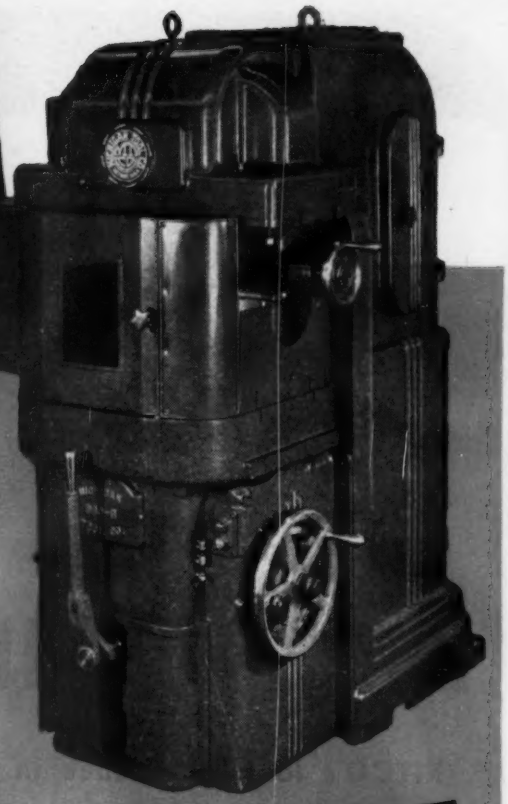
A copy of this folder, describing the modern heat-treating facilities at Ace, will be sent on request.

ACE
TRADE MARK

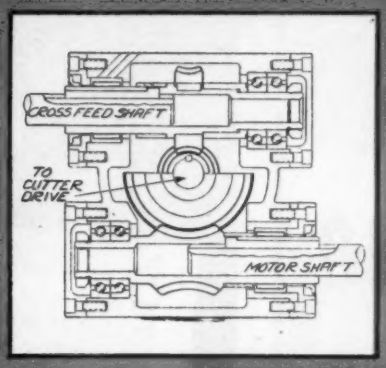
ACE MANUFACTURING CORPORATION
for Precision Parts

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

Contributing to the Smooth, Precision Operation of MICHIGAN GEAR FINISHERS!



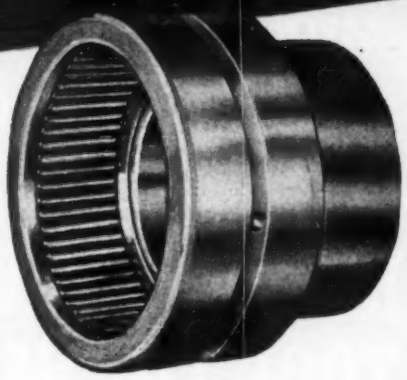
The Cone Drive of Michigan "860" Rotary Gear Finishers is a key factor in the extreme accuracy and smooth finish produced by these precision machines. It is significant that Orange Roller Bushings are used in the cross feed shaft and motor shaft of this vital Cone Drive.



FEW pieces of equipment require the degree of smooth, accurate running demanded in the Michigan Rotary Gear Finisher. So smoothly does it run, that it is almost completely noiseless. A tribute to designing skill and precision parts throughout, among which are Orange Roller Bushings .... chosen for their unusually even, quiet, long-life operation.

The smooth action of Orange Roller Bushings, results from their basic design and extreme standards of precision manufacture. Roller clearances are held to a minimum, providing much closer running clearances, thus preventing rollers from running tangent to the race. This combination of high load-carrying capacity and even running, has placed Orange Roller Bushings at critical spots in well-known equipment of all types. Full range of sizes and types available to meet practically all requirements.

ORANGE ROLLER BUSHINGS



ORANGE ROLLER BEARING CO., INC.
ORANGE • NEW JERSEY

Mail Coupon for Engineering Data

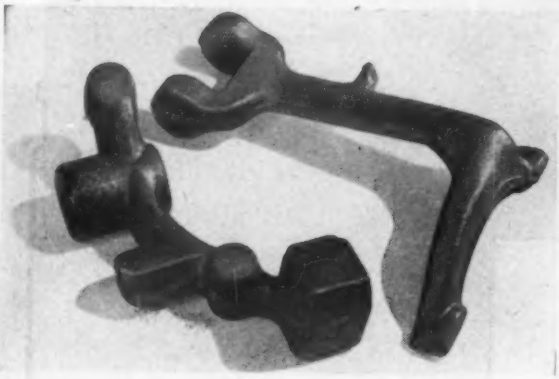
Orange Roller Bearing Co., Inc., AM
Orange, N. J.
Please send me your Roller Bushing Data Book

Name..... Title.....

Company.....

Address .....

City..... State.....



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RITCO's long experience in die sinking and drop forging assures strong parts accurately made to your specifications.

Remember RITCO *for*

SPECIAL BOLTS, NUTS & STUDS
DROP FORGING & DIE SINKING
SCREW MACHINE PRODUCTS
HEAT TREATING
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Estimates gladly submitted. Send samples or blueprints. Catalog on Request.

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CAMS

LET the largest, most completely equipped cam milling plant in the mid-west handle your cam problems. All sizes of drum, face, groove or other styles of cams cut to order in quantities of one or one thousand. Send specifications or blueprints for a quotation on your requirements.

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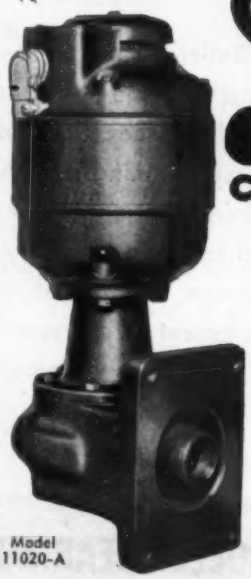
3930-44 W. HARRISON, ST. CHICAGO, ILL.

HIGH FLUSHING CAPACITY

with

GUSHER COOLANT PUMPS



Model 11020-A

And yet, you can cut down the flow to a mere dribble without building pressure.

Gusher Coolant Pumps are being used by leaders in the industry for grinding, honing, cutting, milling, tapping and threading.

Learn the exclusive advantages of Gusher Coolant Pumps. Sizes and types from 1/10 to 2 h.p.

Write for data and specifications.

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1809 READING ROAD CINCINNATI, OHIO

Largest Exclusive Builders of Coolant Pumps

EFFECTIVE AUGUST 3, 1943

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THE CHANGE OF NAME is the only change. The organization, policies and management are unchanged. The ownership is wholly American.

The company continues its license to manufacture DOWTY *"Live-Line"* hydraulic pumps and *"Levered-Suspension"* landing gear. The growing list of products not covered by Dowty patents made the change of name desirable.

HUB products now include . . . *"Live-Line"* hydraulic pumps, hand pumps, gear pumps . . . IHC gear gun turret actuating hydraulic pump . . . *"Levered-Suspension"* landing gear . . . Landing gear for Bell P-39 Airacobra . . . Vickers type oleo strut for Australian Beaufort bombers . . . Landing gear for helicopters . . . USAAF experimental track landing gear . . . Landing gear for Fleetwing B-12 . . . Shock struts for Edo . . . Filters . . . Adel 4-way selector valves . . . experimental aircraft, automotive and industrial projects.

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SPECIALISTS IN HYDRAULIC EQUIPMENT FOR AIRCRAFT AND INDUSTRY

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H. K. PORTER, INC., manufacturers of metal cutting tools since 1880, offer a practical booklet on the use, maintenance and repair of Porter HKP Cutters and other types of small tools. Send for your copy now. All Porter tools are precision built and like parts are interchangeable.

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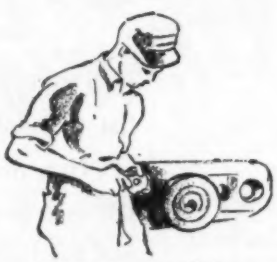

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Obtain your MRO requirements through your Authorized SKF Distributor. He will save your time and dollars—help keep your machines producing 24 hours a day—because he knows antifriction bearings and their application. If he doesn't have the bearing you want, he can probably suggest a substitute which will do until he can get the right one. And, since he's familar with the antifriction bearing delivery situation through his frequent contacts with us, he can utilize *his* knowledge to *your* advantage . . . help *you* keep 'em rolling. 5346

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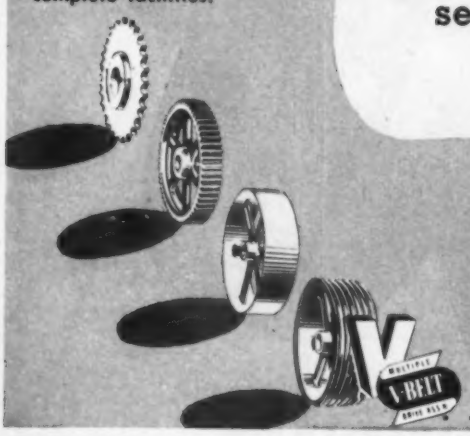
ARE YOU AN *Exacting* GRAY IRON BUYER?

Huge Jolt Roll Over Machine in Pyott Foundry handles patterns up to 144 inches long by 48 inches wide. One of the largest of its kind . . . a typical example of Pyott's complete facilities.

If you are hard to please when it comes to castings, Pyott is *your* foundry. Whether you want a massive casting that weighs several tons, a man size gear or a small pulley, Pyott can make it. Skilled foundrymen and complete equipment for making every type of gray iron casting are combined at Pyott to serve you better. This Pyott combination is tested and proved . . . and has delivered to exacting buyers for forty-six years. Your inquiry on any phase of Pyott Foundry service will receive prompt and careful attention.



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FOUNDRY AND MACHINE CO.

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CAST IRON AND SEMI-STEEL FOUNDRY WORK

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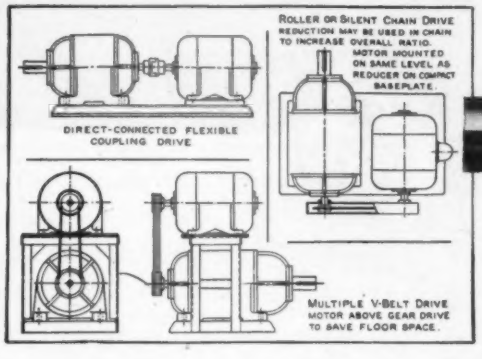
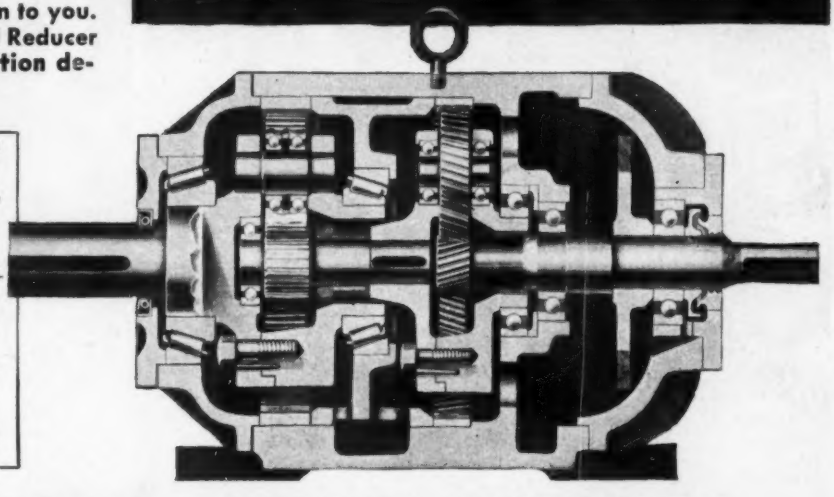
More than ten years ago we introduced the Philadelphia MotoReduceR, a motorized, built-in drive employing the Planetary form of gearing. So successful have been the applications of this type of unit, that it clearly pointed to the need for PHILADELPHIA PLANETARY SPEED REDUCERS for those services where straight-line drives (separate from the motor) were desirable. Into these we put the same high grade parts and precision manufacture that made MotoReduceRs so widely acclaimed for their dependability and efficiency.

Philadelphia Planetary Reducers are available in single, compound and double reduction types in a variety of horsepowers and reduction ratios. The several methods of installation shown in the diagram here may suggest an application to you. If so, write today for our Planetary Speed Reducer Bulletin No. 100 which gives construction details, sizes and horsepower ratings.


DIRECT-CONNECTED FLEXIBLE COUPLING DRIVE.
ROLLER OR SILENT CHAIN DRIVE. REDUCTION MAY BE USED IN CHAIN TO INCREASE OVERALL RATIO. MOTOR MOUNTED ON SAME LEVEL AS REDUCER ON COMPACT BASEPLATE.
MULTIPLE V-BELT DRIVE. MOTOR ABOVE GEAR DRIVE TO SAVE FLOOR SPACE.



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INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS

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New York, Pittsburgh, Chicago

***Philadelphia* LIMITORQUE CONTROL** operates all types of valves, etc., safely, economically, from convenient stations.

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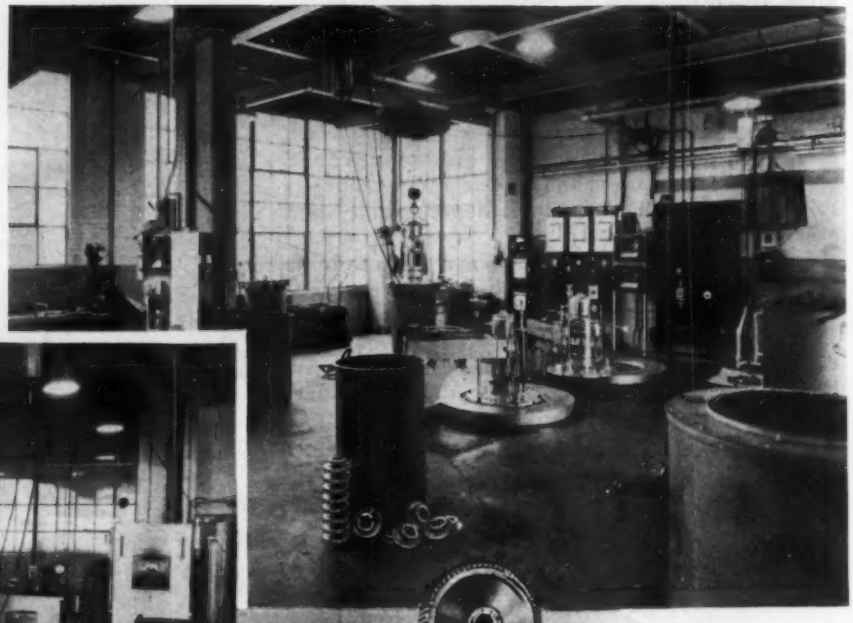
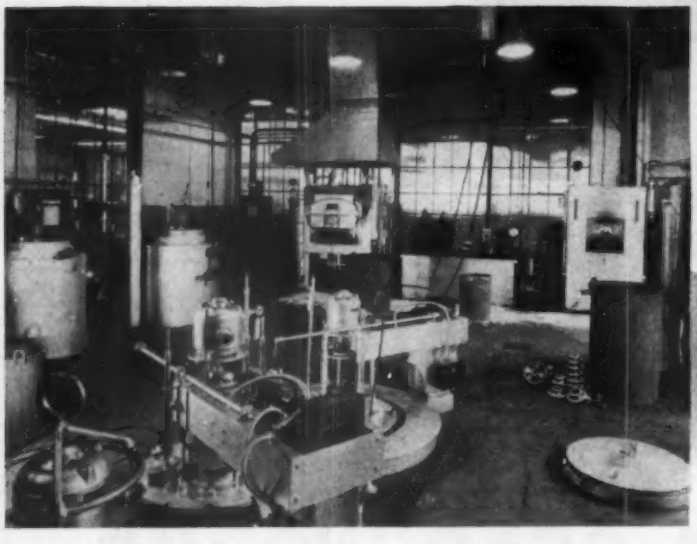
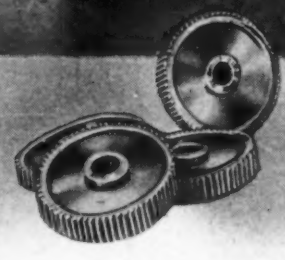






The importance which Sier-Bath attaches to the heat-treating of gears is reflected in the comprehensiveness and high class of furnace and control equipment employed for this purpose. Some idea of the completeness of SIER-BATH'S modern facilities is obtained from these views of the Heat Treating Department shown here — all under the expert supervision of an operating technician of long experience.

Write, wire or phone your specifications, giving high priority.

As a vitally important service to production, SIER-BATH heat treating provides outstanding assurance that every gear will meet the most exacting demands for high uniform quality and long life under the most severe conditions of service — particularly important advantages today because, as vital parts of war equipment, gears must stand up in the field and perform their functions dependably with minimum attention. War equipment must keep rolling — time out for repairs or replacements cannot be tolerated.

When you come to Sier-Bath for gears you can be sure you will get the maximum in quality, strength and precision.

The Doorway to 38 years experience in making Precision Gears

SIER-BATH GEAR CO.

NORTH BERGEN NEW JERSEY

Incorporated

★ *Back from a bombing mission—an engine missing—a rudder all but shot away. Under trees, on sandy deserts, our skilled Air Corps mechanics are "keeping 'em flying"—within earshot of enemy guns.*

Get 'er *Flying* in a hurry

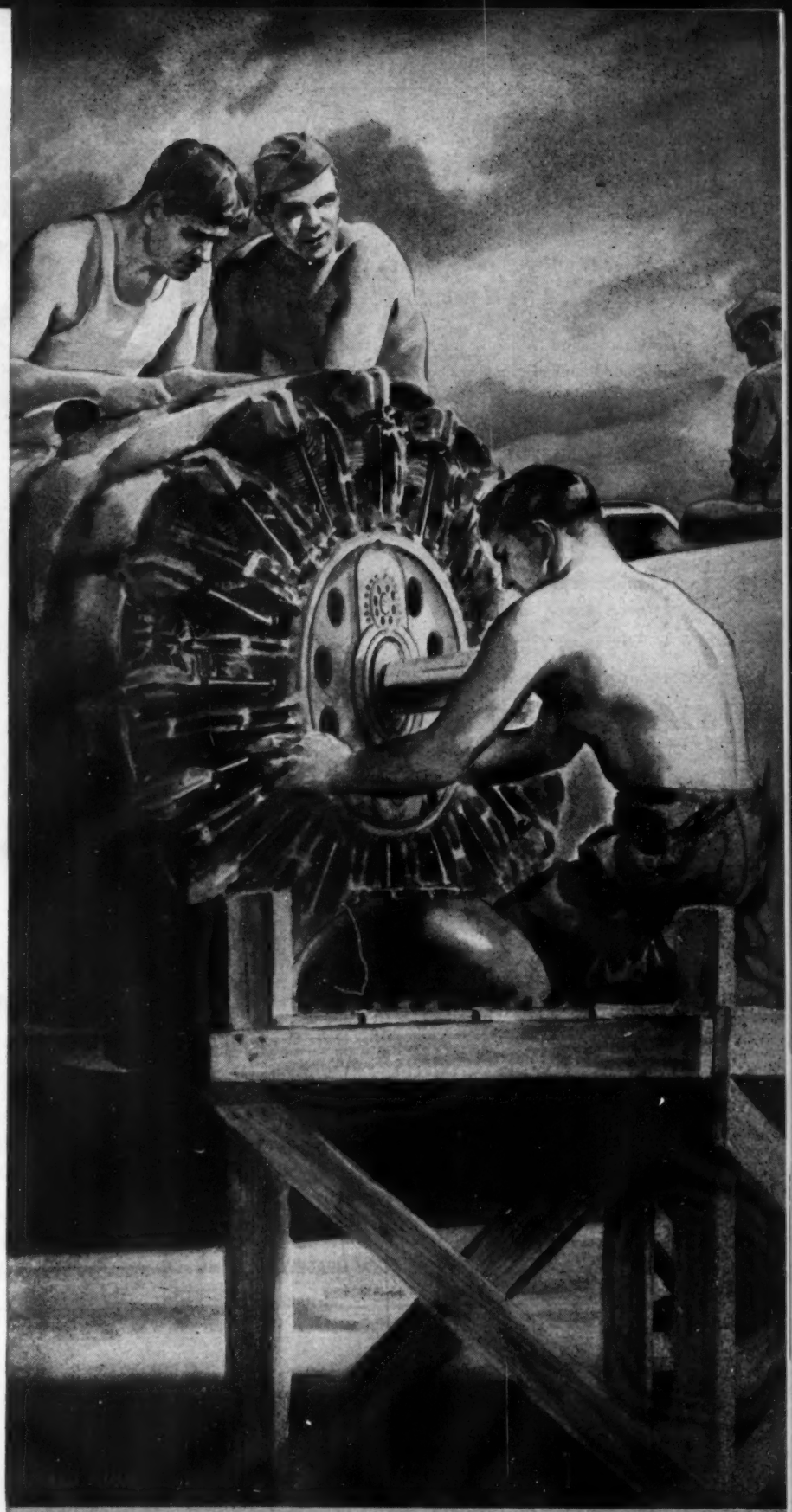
When a mission must be carried out, there is no time to baby an airplane! The machine shop may be under a tree with the sky for a hangar roof, but the orders are: "Get 'er flying—in a hurry!"

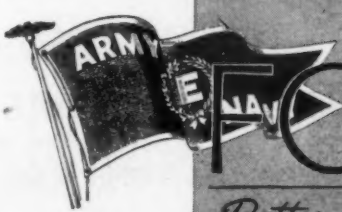
It takes a tough ship to stand the daily pounding these missions entail. It takes a tough engine to keep that ship flying with minimum time out for repairs and overhauls. And this is the job that Pratt & Whitneys are performing—a job that is writing their fame in smoke and fire over Axis-ruled lands.

But the toughness of these engines comes, not from rugged construction—not from "beefed up" parts, but from the close tolerances to which every part is held—a precision that makes possible great strength coupled with lightness.

The lightweight precision gears that have been developed for this engine—gears that are today being made in huge quantities at Foote Bros.—give promise to American manufacturers of new efficiency and new economy in the transmission of power when the war is won.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5225 S. Western Boulevard • Chicago, Ill.





FOOTE BROS

Better Power Transmission Through Better Gears

Gear Specialties

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

This range logically embraces the gear components of many critical control devices essential to the war effort and this organization is proud of its contributions of such material in the program.

With full *production capacity* scheduled far into the future, all new inquiries are now necessarily subordinated to these vitally important prior commitments. However, every *urgent* need will be given careful consideration.

Gear Specialties
MANUFACTURERS
CHICAGO

2600 W. Medill Av. Ph. Hum. 3482

For more than 40 years we have been making gears of every type and size to meet both usual and unusual requirements. Whether your needs call for spur, bevel or worm gears, it will pay you to consult with Earle engineers. Send today for the Earle Gear Booklet 42-G which contains full information.

THE EARLE GEAR & MACHINE CO.
4723 Stenton Avenue, Philadelphia, Pa.

EARLE GEARS

GEAR CUTTING MACHINES

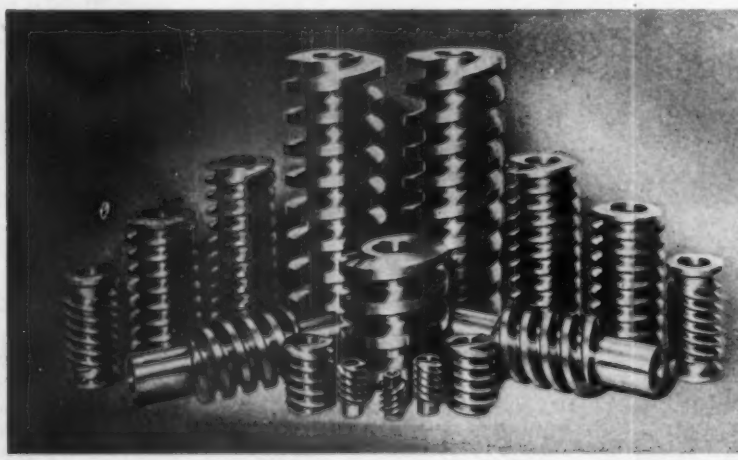
New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK, NEW JERSEY

EACH GEAR A MASTER GEAR

and the way MEISEL builds gears, there's just one *right* gear for any specific job. Designed for use under conditions that exist, MEISEL Gears actually "belong" to a machine . . . are inherently able to give longer, quieter, more economical service. Investigate the advantages of *specifically* engineered gears by MEISEL.

MEISEL PRESS MFG. CO.
946 Dorchester Ave. Boston, Mass.



ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa

Gears—

FOR THE WORLD OF TOMORROW

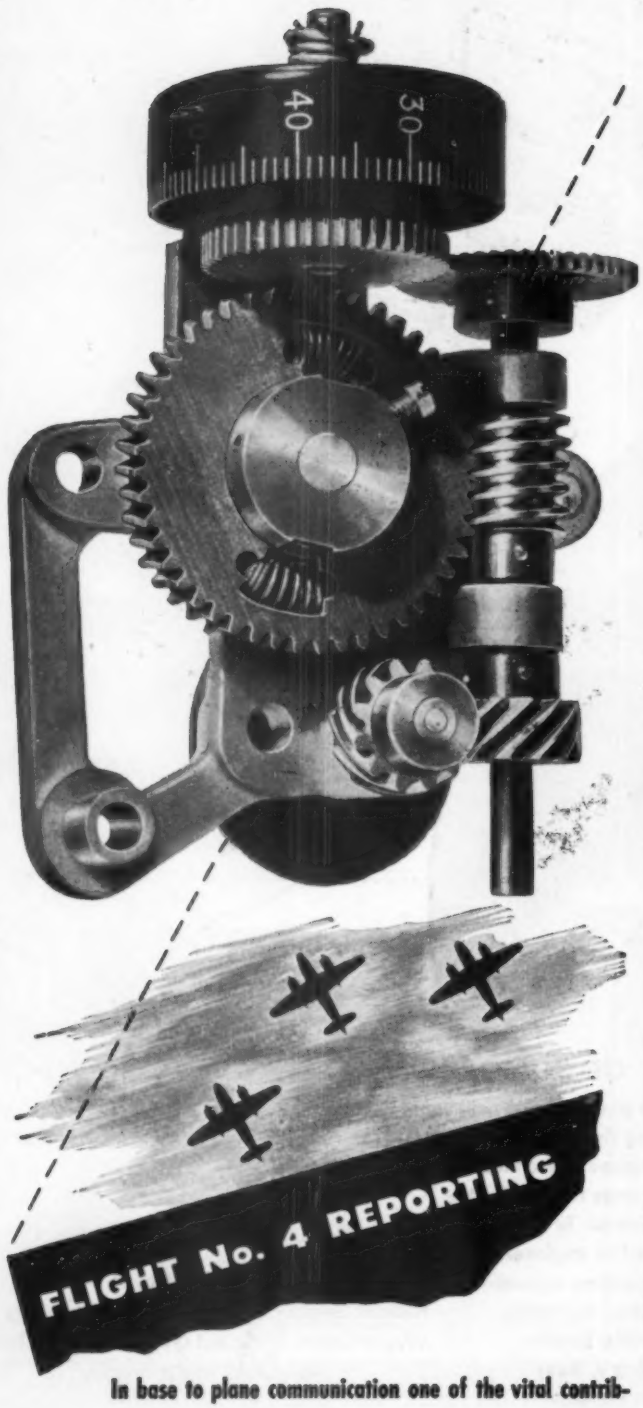
The revolutionary new or improved products that will loom large on tomorrow's skyline are taking shape today in thousands of laboratories. New lines of engineering endeavor—nebulous ideas yesterday—are taking concrete form under the skilled hands of highly trained Design Engineers. To these engineers, Perkins freely offers the assistance of its engineering staff on any problem involving the use of precision custom-cut gears. Right now, Perkins is right in the thick of the battle—producing gears for the equipment of our fighting forces—gears that are meeting the specifications of our Army, Navy and Air Corps. But it is not too early to inquire about the gear problems for your post-war products NOW.

PERKINS MAKES:

Helical Gears *Bevel Gears* *Ratchets*
Worm Gears *Spiral Gears* *Spur Gears*
Ground Thread Worms

PERKINS MACHINE & GEAR COMPANY

SPRINGFIELD 2, MASSACHUSETTS



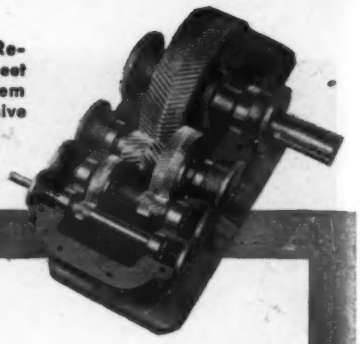
FLIGHT No. 4 REPORTING

In base to plane communication one of the vital contributing factors toward the accuracy of pin point tuning is precision gears, and we are proud to say that QUAKER CITY GEARS are playing their part in assuring this accuracy.

Quaker City Gear Works
INCORPORATED

1910-32 NORTH FRONT STREET, PHILADELPHIA, PENNSYLVANIA

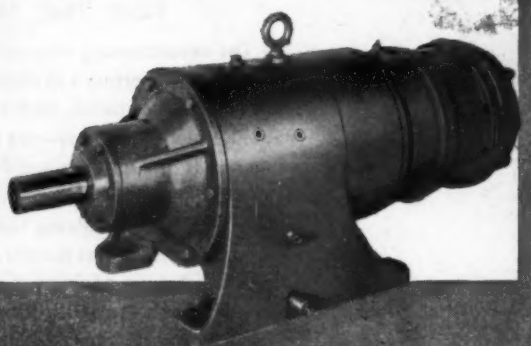
D.O.James Gear Speed Reducers are produced to meet any Power Saving Problem and are made in an extensive range of sizes and ratios.



the obligations and opportunities of tomorrow!

ARMY E NAVY

The experience derived from the successful handling of industry's vast war-time gear and gear speed reducer requirements by our organization gives us an initiative that will prove invaluable to our capability of meeting the obligations and opportunities of industry's post-war gear and gear reducer requirements.



D.O.James

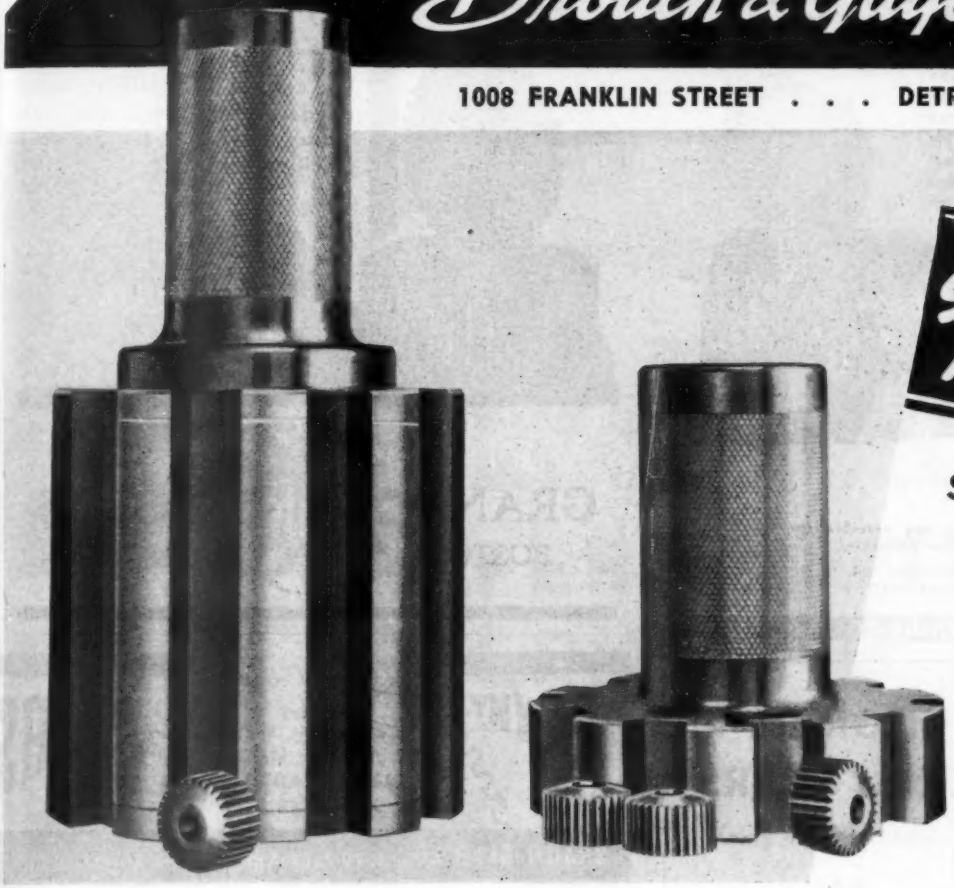
ESTABLISHED 1888

D.O.JAMES MANUFACTURING CO.
1140 W. Monroe Street, Chicago, U.S.A.

MAKING ALL TYPES OF GEARS AND GEAR REDUCERS

GREAT LAKES
Broach & Gage Company

1008 FRANKLIN STREET . . . DETROIT 7, MICHIGAN



STANDARDS FROM STOCK

S.A.E. SERRATION PLUG GAGES

•

EXCELLENT DELIVERIES AT THE PRESENT TIME

BROACHES:

Round . . . Sectional . . . Keyway . . . Spline . . . All Types, All Sizes . . .

GAGES:

Serration . . . Straight and Involute Splines, Male and Female.

MASTER GEARS AND MASTER INDEX PLATES

Splined Arbors for gear-grinding, hobbing, shaving and checking.

GEAR DESIGNING AND ENGINEERING

. . . Form Cutting Tools . . .

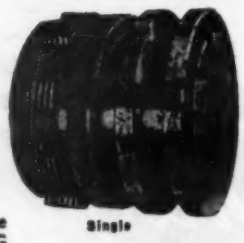
SPECIALISTS IN MANUFACTURING OR RE-CONDITIONING HOB-SHARPENING MASTER INDEX PLATES

GL B&G Co.

THE JOHNSON FRICTION CLUTCH

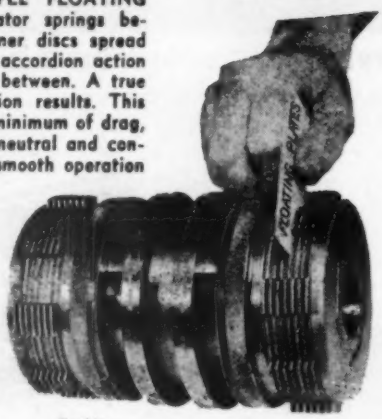
MINIMUM DRAG ASSURES COOL RUNNING WITH THE

NEW "MAXITORQ"



Single

In the design and construction of the "MAXITORQ" MULTIPLE FLOATING DISC CLUTCH, separator springs between each pair of inner discs spread these endways with an accordion action so that there is space between. A true floating type construction results. This feature accounts for a minimum of drag, abrasion or heating in neutral and contributes to remarkably smooth operation as well as quick disengaging.



Double

Other features of performance and operation include simple manual adjustment, sensitive starting, safety and quietness. Heat and abrasion, ordinarily inherent in many clutches of the multiple disc type are eliminated in the "MAXITORQ."

Send for dimension sheets and specifications covering the sizes and types available.

WRITE FOR MULTI DISC CLUTCH CATALOG NO. 93 OR CONSULT SWEET'S OR THOMAS' REG.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

GRANT GEARS

"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS

BOSTON, MASS.

ESTABLISHED 1857 — BY GEO. B. GRANT

BILGRAM BEVEL GEARS

Straight — Spiral Teeth

BILGRAM

ALL TYPES
ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

BRAWNY GEARS

PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
AND QUANTITIES
Ask for Estimate

BRAUN GEAR CO., 1590-1608 Atlantic Ave., Brooklyn, N. Y.

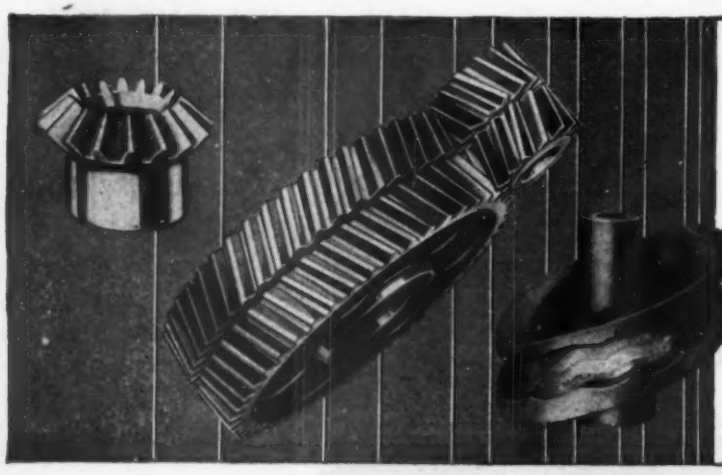
GANSCHOW GEARS

FOR SIXTY YEARS

Spur — SPEED REDUCERS — Worm

ALL TYPES OF CUT GEARS

GANSCHOW GEAR CO., 18 N. Morgan St., Chicago



GET YOUR QUOTATION *from* "HARTFORD"

GEARS of every description cut to order

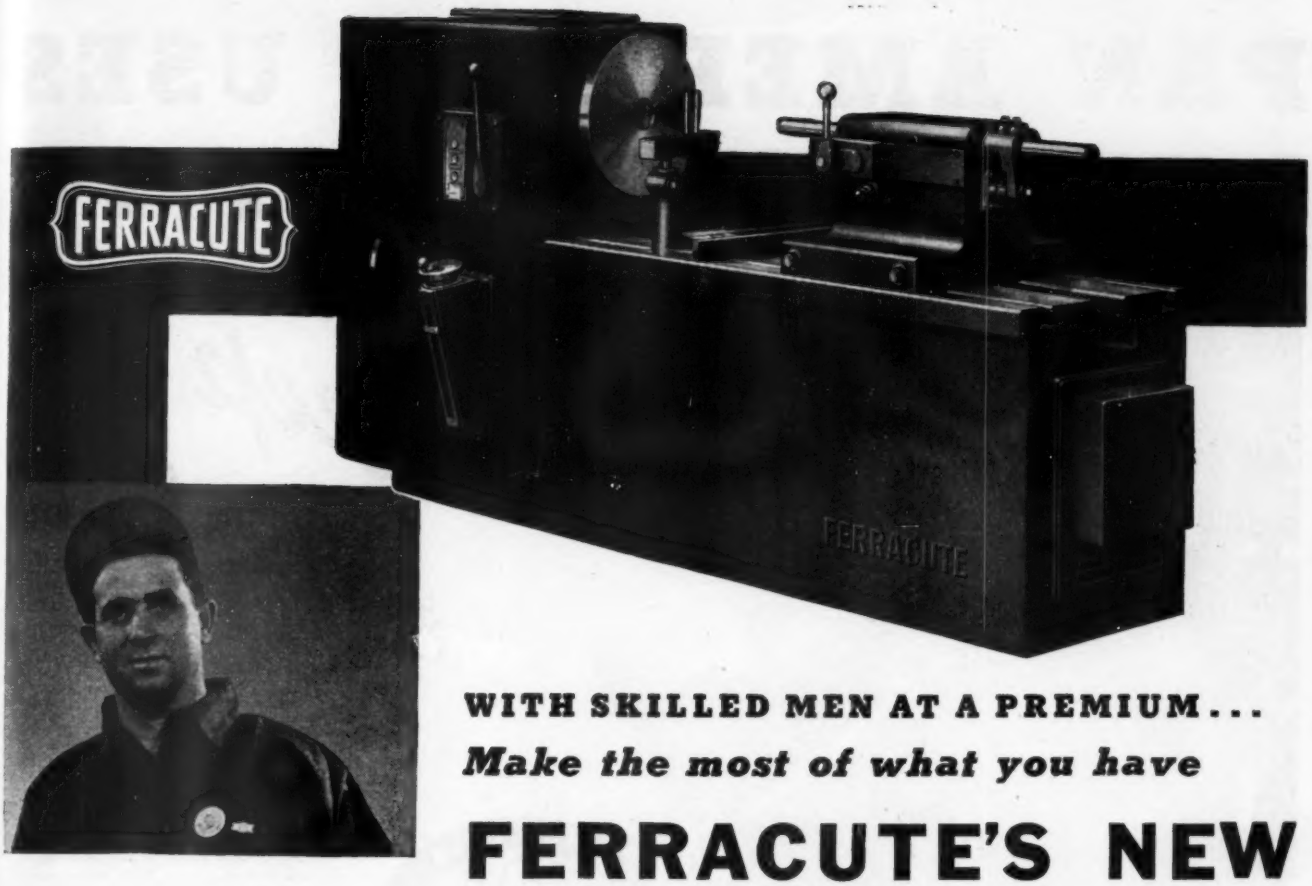
GEAR, CAM and THREAD grinding

AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY

HARTFORD CONNECTICUT



WITH SKILLED MEN AT A PREMIUM . . .

Make the most of what you have

FERRACUTE'S NEW SPINNING LATHE

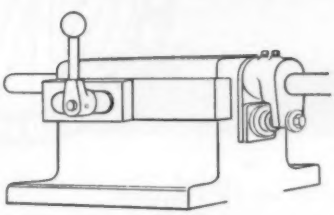
SIMPLER—FASTER—REQUIRES LESS EFFORT

Skilled spinning lathe operators cannot be quickly turned out of raw recruits—men or women. With many shop men considering this one of the most difficult operations they are called upon to perform, it becomes apparent that there is no short-cut training to replace the needed experience. In this situation, any new equipment that will help your present skilled men produce MORE per man and per machine is a "must." FERRACUTE SPINNING LATHE is designed to do just that. Movements by the operator are much simpler and faster than in conventional practice; controls are much more convenient, and far less effort is required.

SAVE TIME ON THESE STANDARD OPERATIONS:

Spinning
Buffing
Burnishing
Trimming
Wiring
Beading

In keeping with the Ferracute tradition of plus-age in strength and weight, the frame of Spinning Lathe 224 is of cast iron, rugged construction of ample weight to guard against vibration when rotating work at highest speeds.



SINGLE LEVER CONTROL
Air-operated tailstock spindle

One spindle-operating lever, conveniently located for right-hand control, is moved toward the work and the spindle travels forward. Further movement, in the same direction, locks the spindle firmly against the work. Movement of the lever away from the work unclasps the spindle and causes it to withdraw.

VARIABLE SPEED CONTROL
Built-in Motor

Motor has 2 speeds, selected by push-buttons on motor-control panel. To employ any speed between 200 and 600 RPM or between 500 and 1000 RPM, operator rotates the speed-adjusting handwheel. Higher speeds are available. Speed, indicated by graduated gauge, may be varied while lathe is running.

INSTANTANEOUS START AND STOP
Single lever control of clutch and brake

With the motor running, a pull of the control lever engages a dry-disc clutch—and the spindle immediately comes up to speed. A short movement of same lever to left engages brake to bring spindle to rest instantaneously. No drag—no drift.

SEND FOR NEW SPINNING LATHE BULLETIN

Bulletin giving full specifications now available. Deliveries on Ferracute Spinning Lathe No. 224 can be scheduled now. Consult us concerning practical and economical applications of this machine.

FERRACUTE MACHINE COMPANY

Spinning Lathes · Presses · Press Brakes

BRIDGETON, NEW JERSEY, U. S. A.

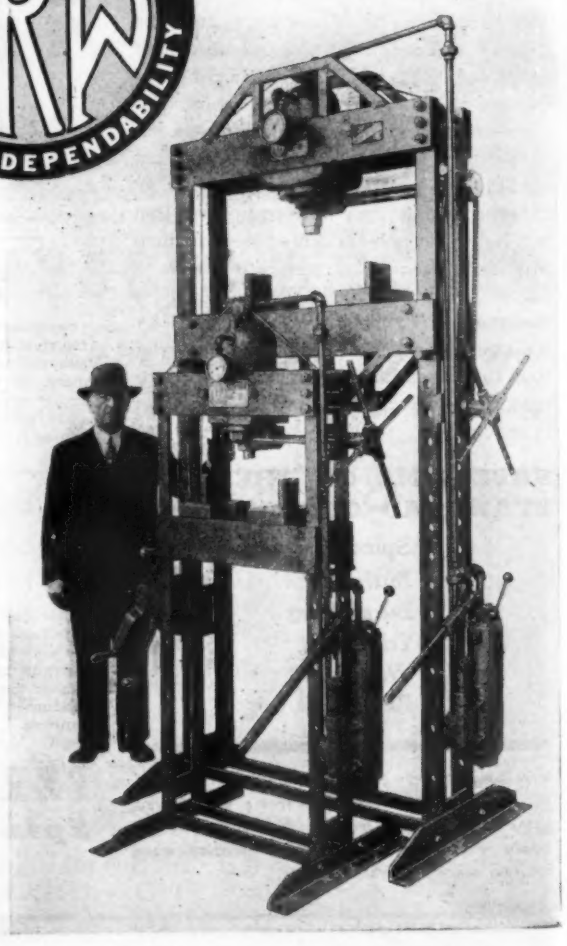
PAN AMERICAN USES KRW EQUIPMENT TO

"Keep 'em Flying"

Illustration at left shows a KRW 3-ton Bench Type Arbor Press in use in Pan American shops.

SINCE 1916 KRW A MARK OF DEPENDABILITY

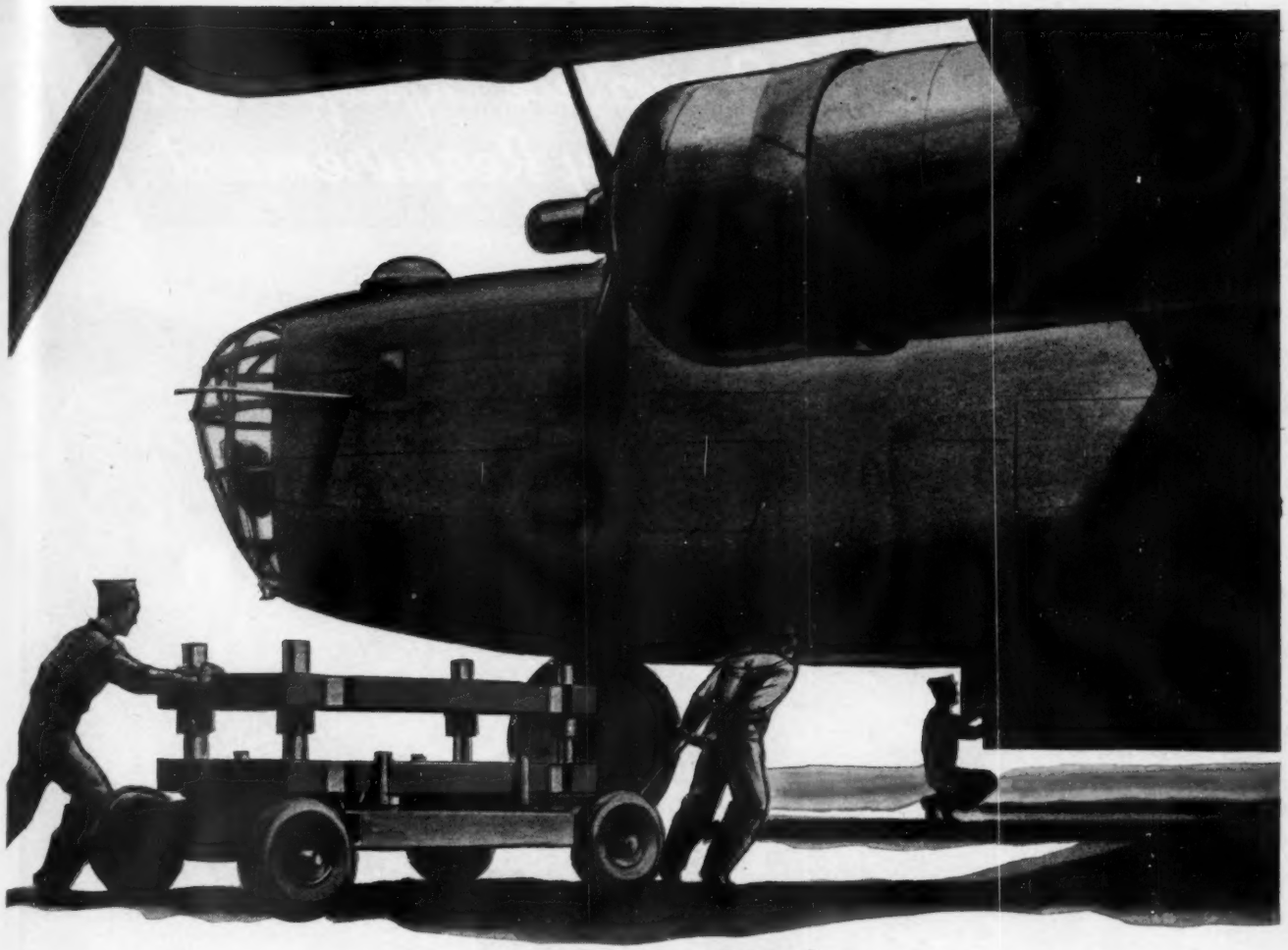
Illustration below shows a special extra high 75-ton KRW Hydraulic Arbor Press in comparison with the standard 25-ton unit.



● Girdling the globe as it does, and with every Clipper serving some phase of the war effort, Pan American insists on the best possible equipment in its shops—to speed overhaul and increase the number of trips per plane per month. That you find them using KRW Arbor Presses and other equipment is further proof of this policy.

KRW Hydraulic Arbor Presses are Engineered for War Production. Hundreds of them have already been speedily adapted to handle many unusual production jobs—without time-consuming engineering delays. KRW builds standard Hydraulic Arbor Presses in 25, 50, 60 and 75-ton capacities and Bench Type Arbor Presses in 1/2, 1 and 3-ton capacities.

K. R. WILSON
10 LOCK ST., BUFFALO 2, N. Y.



They don't load Die Sets in BOMB BAYS

Die sets are work-a-day products that stay at home, holding and guiding the dies that stamp out and form plane parts by the millions. We can safely and proudly say that Danly Die Sets have speeded America's air program.

Danly facilities and service have been steadily increased since 1940. One of the major objectives was to be ready for the mass production of planes—that was sure to come—that came—planes that are blasting the way to winning the war.

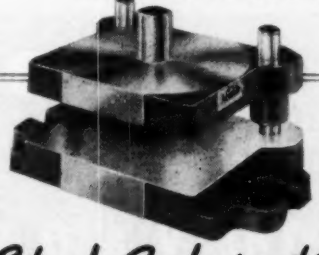
If you need die sets in any phase of your production call Danly.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago, Illinois

Call Danly:

CHICAGO	*Lawndale 7440*
MILWAUKEE	*Broadway 1644*
DETROIT	*Cherry 6666*
CLEVELAND	*Express 0300*
DAYTON	*Fulton 6651*
ROCHESTER	*Main 2554*
PHILADELPHIA	*Radcliff 2323*
LONG ISLAND CITY	*Ironsides 6-8080*

DUCOMMUN METALS & SUPPLY CO.
Los Angeles . . . *Kimball 0181*

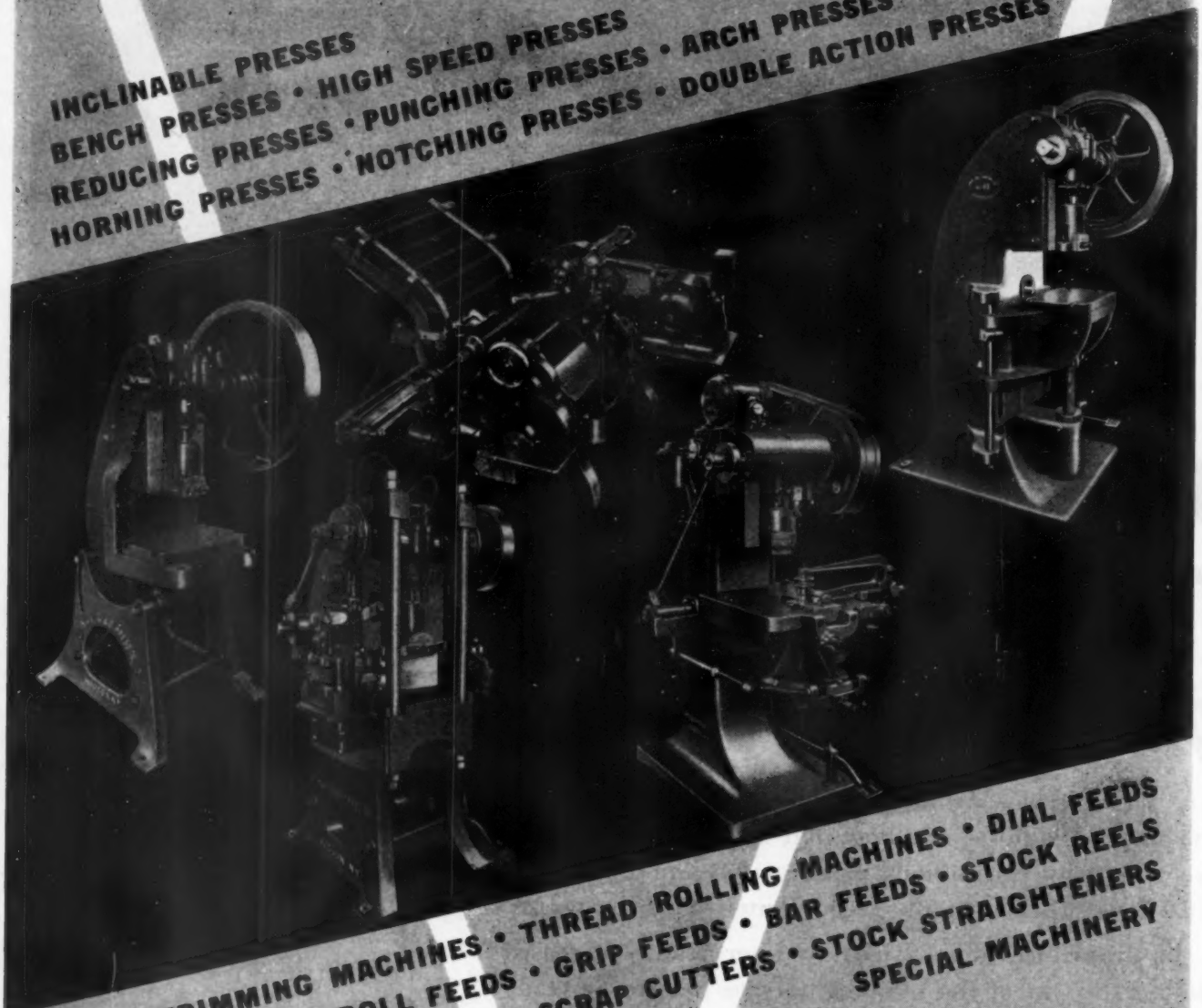


DANLY DIE SETS

Welded Steel Fabrication

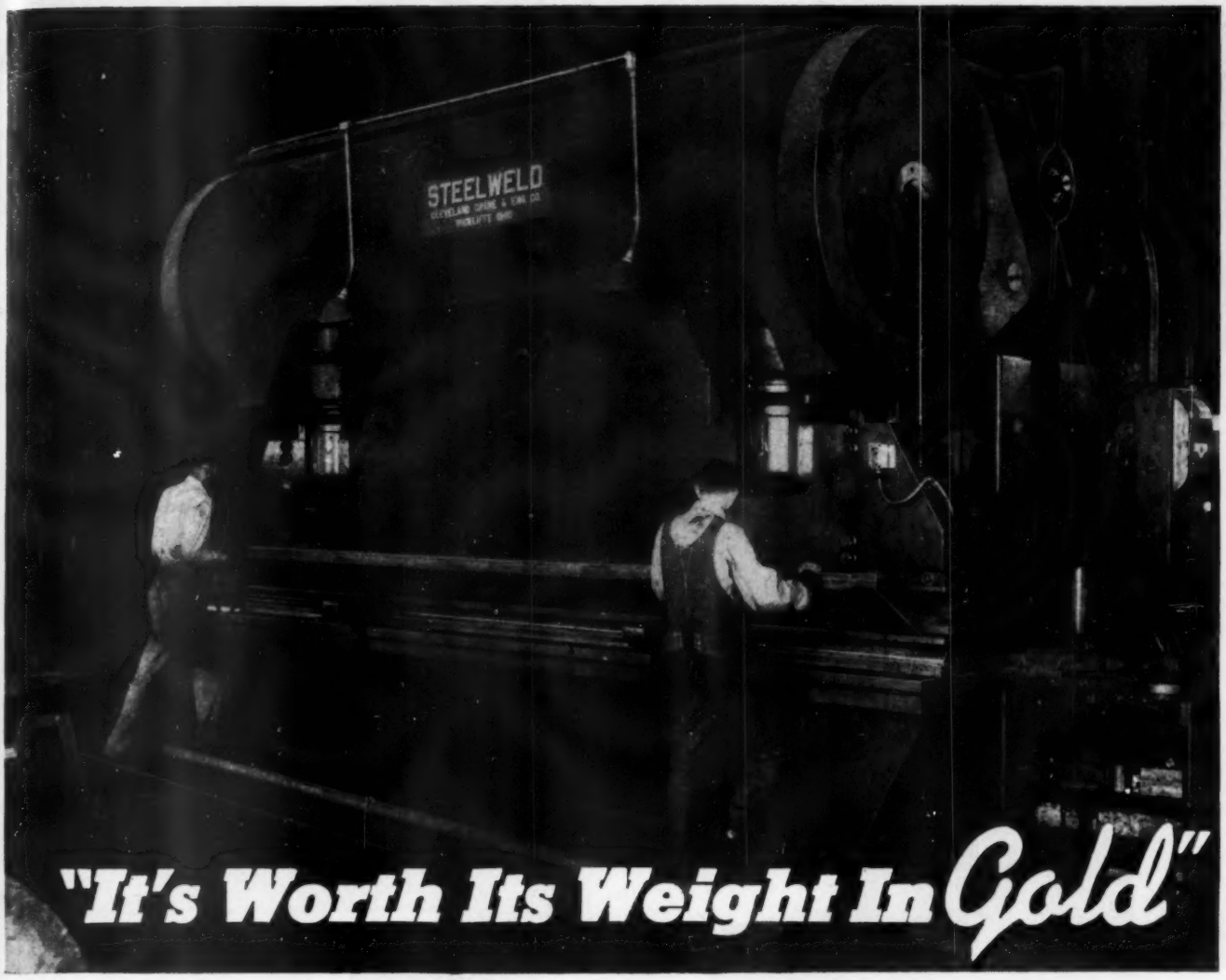
A Press and Complete Equipment to Meet Your Every Requirement

INCLINABLE PRESSES
BENCH PRESSES • HIGH SPEED PRESSES
REDUCING PRESSES • PUNCHING PRESSES • ARCH PRESSES
HORNING PRESSES • NOTCHING PRESSES • DOUBLE ACTION PRESSES



TRIMMING MACHINES • THREAD ROLLING MACHINES • DIAL FEEDS
ROLL FEEDS • GRIP FEEDS • BAR FEEDS • STOCK REELS
SCRAP CUTTERS • STOCK STRAIGHTENERS
SPECIAL MACHINERY

THE V & O PRESS COMPANY, HUDSON, N. Y.



"It's Worth Its Weight In Gold"

Model M6-12 Cleveland Steelweld forming scow channels of plate 3/8" x 14'-6"

"Our big Steelweld Press is worth its weight in gold these days", writes the vice president of Rotary Lift Company, Memphis, Tenn.

It's during trying periods like the present that Cleveland Steelwelds are worth a great deal to their owners everywhere. Because they are extremely versatile tools that can be adapted to a wide variety of jobs, it is easy to switch them from one type of work to another. Peace-time work this morning, war productions this afternoon or vice versa, it is all readily accomplished.

Rotary Lift purchased their Steelweld in 1936 for the manufacture of elevator cars. Now, busily engaged in war work, they use it for fabricating barge parts. When peace comes they hope to be again using it for the production of hydraulic elevating devices for which they are well known throughout the land.

The great advantage of Cleveland Steelweld Presses is that they not only will bend and form plate but that by a quick, easy change of dies, they will handle drawing, corrugating, punching and beading operations with equal dispatch. Plate up to 20'-0" long can be worked on the large machines.

GET THIS BOOK!

CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

THE CLEVELAND CRANE & ENGINEERING CO.

1127 EAST 283RD ST. WICKLIFFE, OHIO.

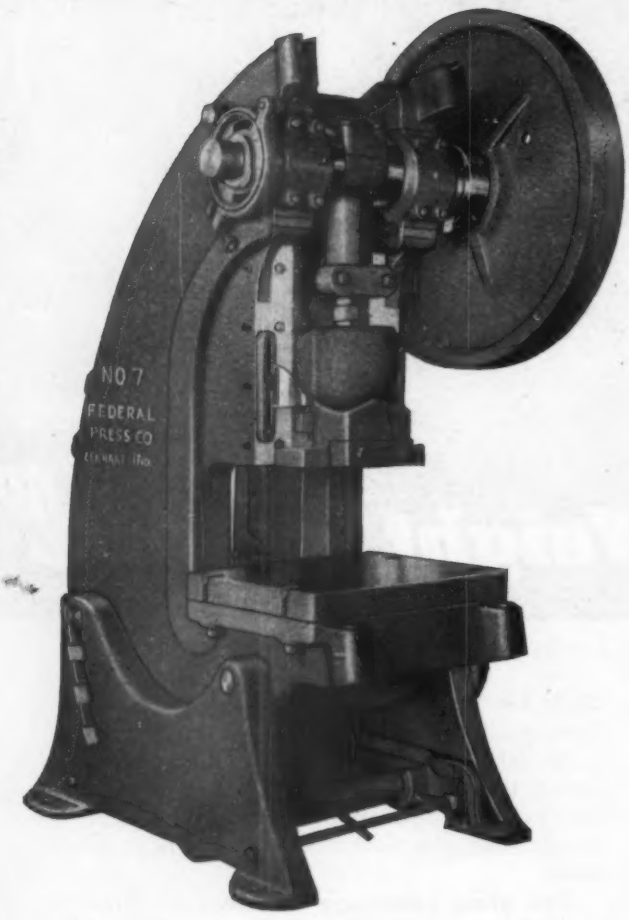
CLEVELAND

STEELWELD PRESSES

GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND

CUSHION MANPOWER SHORTAGE WITH THIS

PRESS OF MANY USES



By staking the terminals of a radio switch section on a 12-station Federal Dial Feed Press, assembly time is reduced substantially, and a possible bottleneck in production is avoided.

Machine gun belt links, made complete from strip stock, are produced accurately and at high speed on standard Federal Presses equipped with roll feeds and automatic stops.

Special part used in assembly operation on Federal Dial Feed Press. Plate is first pressed into place; then stud is riveted over the plate, completing the operation.

Federal Presses are used for several precise forming operations in the manufacture of bullets. Accuracy and pressure must be constant. No variations are permissible in such work

THOUSANDS of Federal Presses of all types and sizes today are serving their owners in a wide variety of unusual ways—cushioning manpower shortages—speeding the production of sorely needed war equipment which formerly required special machinery with limited utility, suitable for only highly specialized work. And they are reducing costs as well! The versatility of standard Federal Presses is limited only by the resourcefulness of the production engineer. Primary, secondary, and assembly operations are accomplished quickly, safely, and precisely. Burnishing, forming, staking, and high speed marking are handled with ease. If you have any jobs requiring specialized press work, write for literature, or for the help of our engineers in working out a specific problem. No obligation.

THE FEDERAL PRESS CO.

309 Division Street, Elkhart, Indiana

FEDERAL

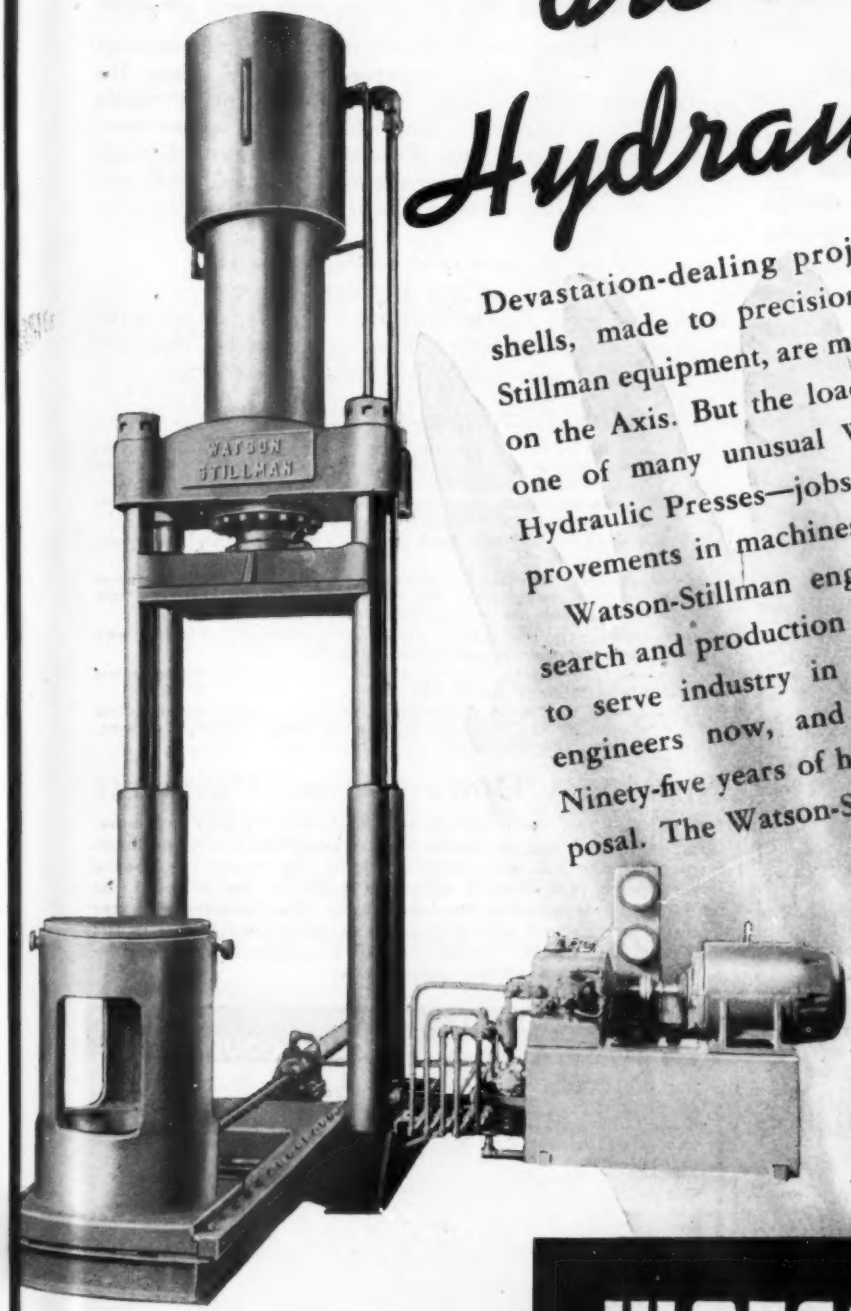
OPEN-BACK—INCLINABLE

PRESSES

BLOCK BUSTERS are made Hydraulically

Devastation-dealing projectiles and high-explosive shells, made to precision specifications on Watson-Stillman equipment, are making their power felt in raids on the Axis. But the loading of Block Busters is only one of many unusual War Jobs performed by W-S Hydraulic Presses—jobs which have inspired many improvements in machines and in their functions.

Watson-Stillman engineers, aided by expanded research and production facilities, will be better equipped to serve industry in its post-war jobs. Consult W-S engineers now, and be ready for the change-over. Ninety-five years of hydraulic experience is at your disposal. The Watson-Stillman Co., Roselle, N. J.



This is the machine used in munition loading plants to produce the 1600 lb. bombs. General Bulletin No. 110-A covers the complete line of these presses.

★ ★ ★

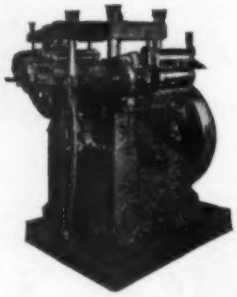
We have capacity available for making turbines, pumps, engines, sub-assemblies, automatic machinery.

As manufacturers of the Dieing Machine — one of the outstanding pieces of automatic machinery in the war program — we are unusually well equipped to design and make automatic machinery for others. Our greatly augmented capacity permits this, and is enabling us to handle a substantial volume of outside work, including turbines, pumps, Diesel engines, and various ship sub-assemblies, as well as complete machines.

We will work with you on devising basic designs, on revising machines to fit new applications, or purely on the manufacture of items to already accomplished specifications.

Submit your problems to us. You will find us thoroughly grounded in the most modern techniques of automatic machinery.

Make your Stampings on the Henry & Wright Dieing Machine



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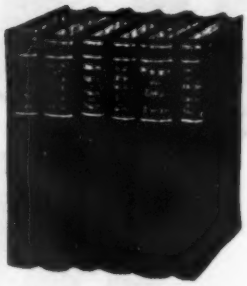

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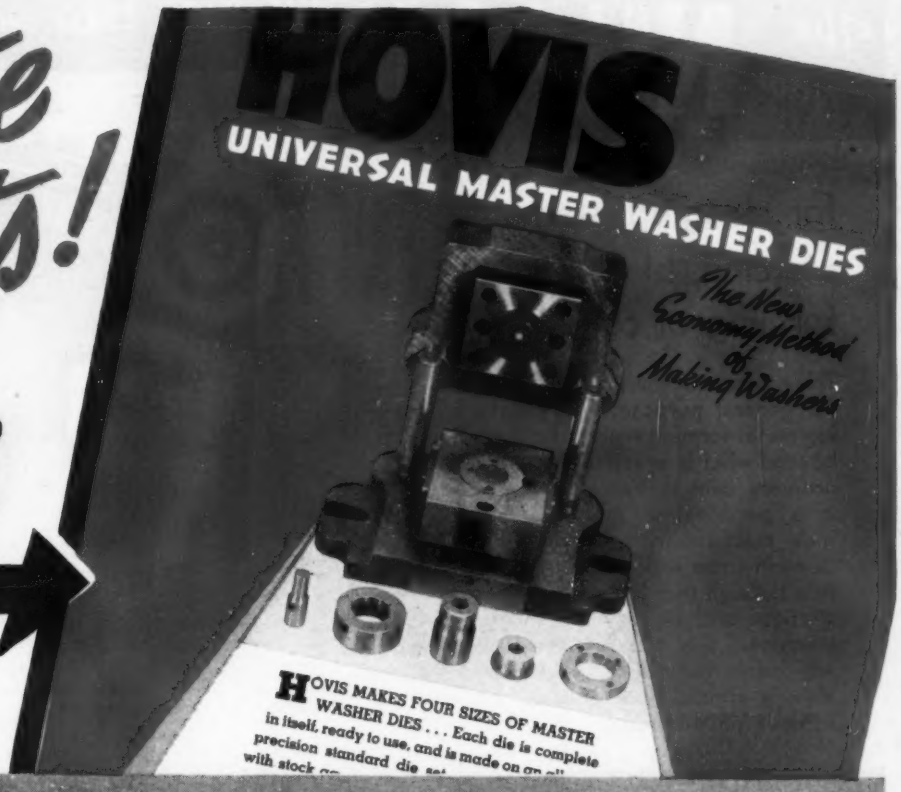
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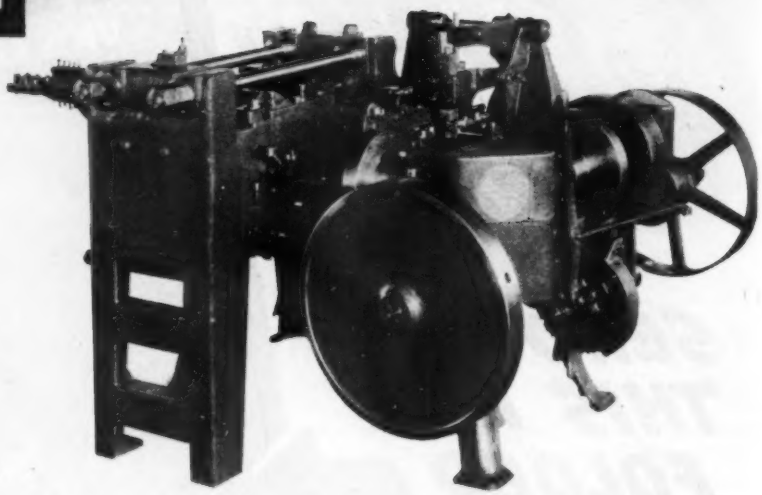

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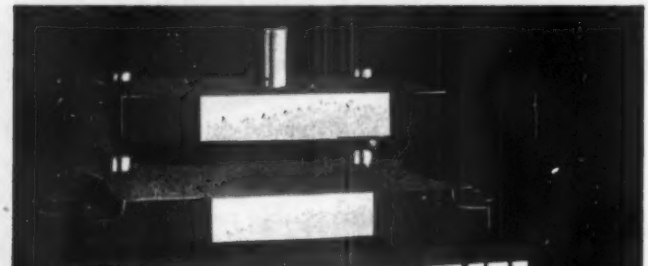

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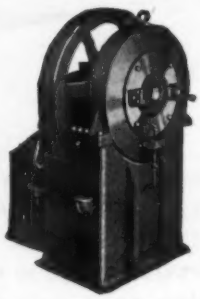

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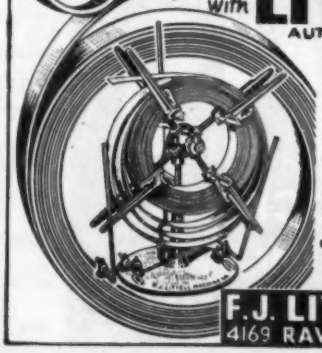

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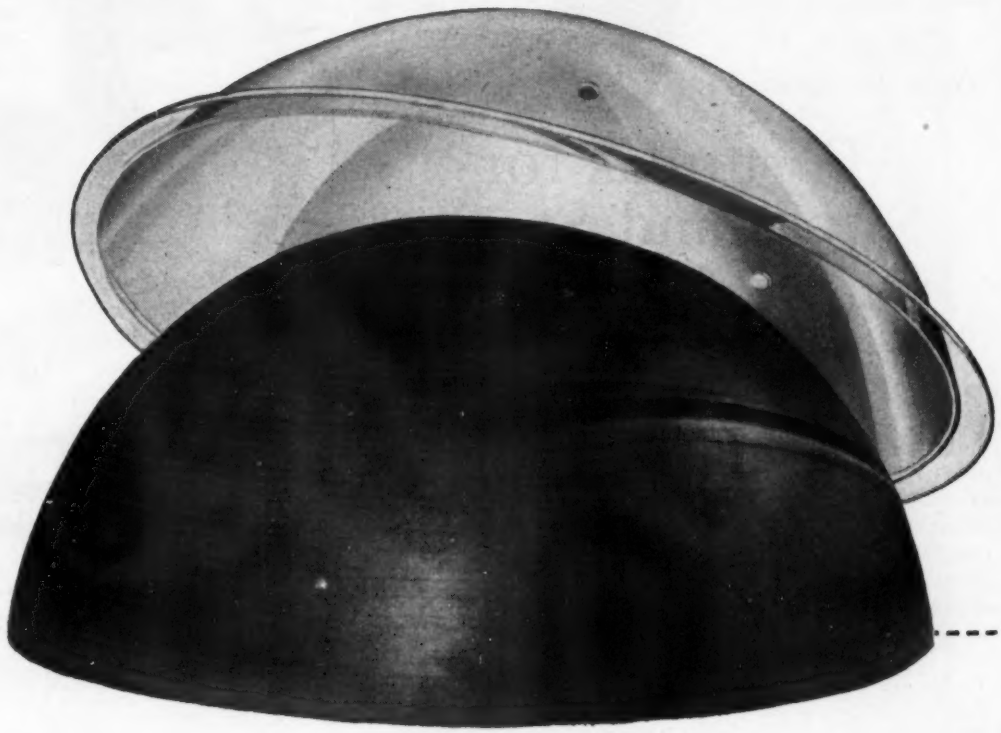

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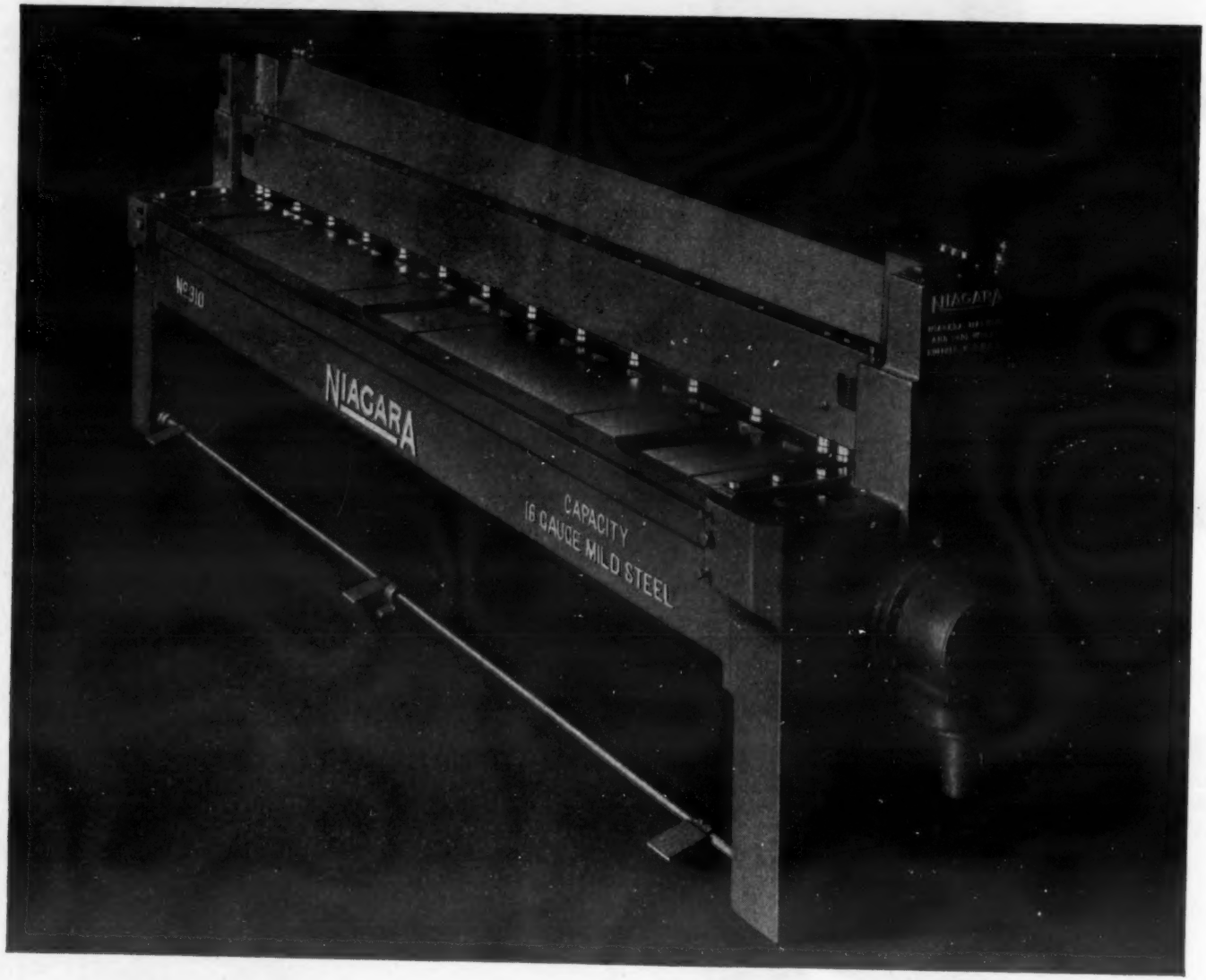

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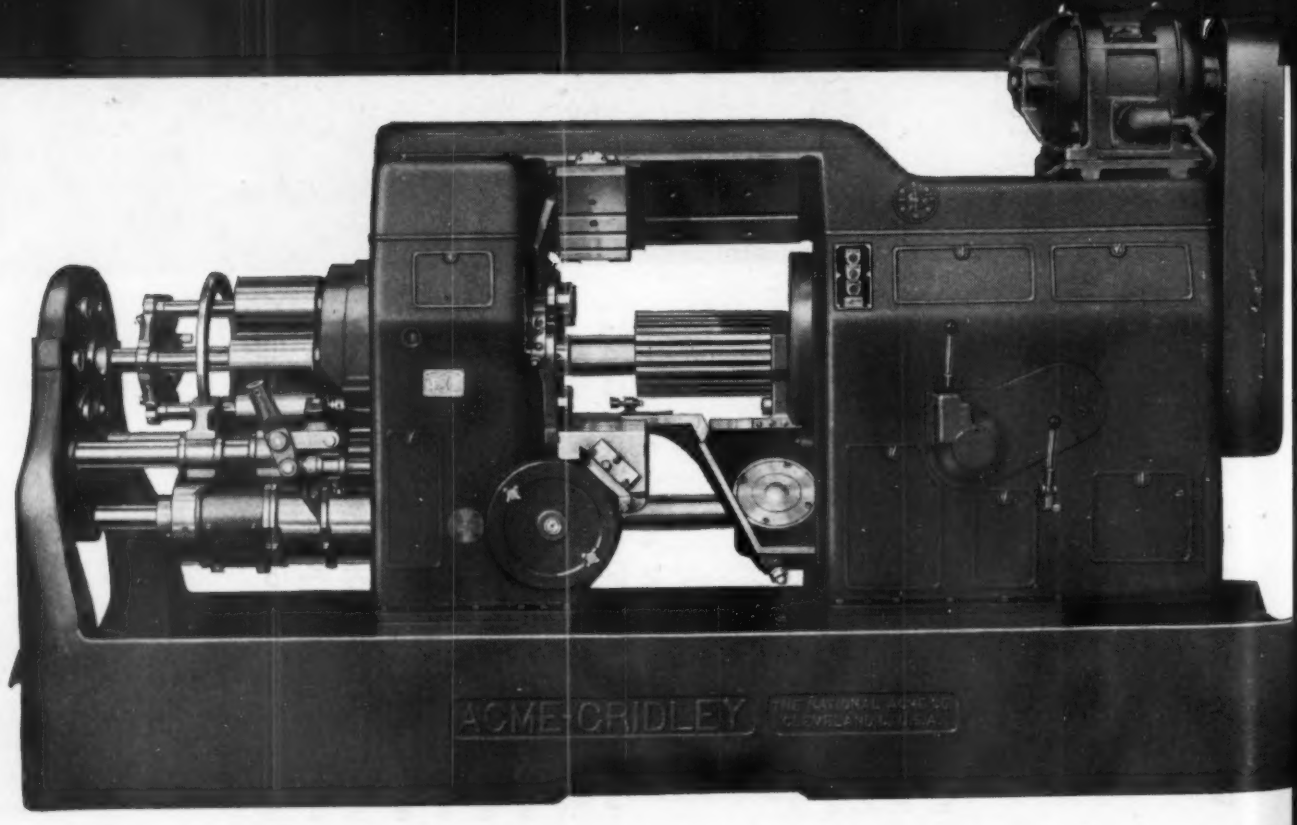

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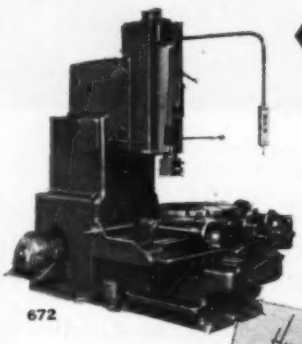
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◆ The 12″ *Hy-Draulic* Slotter, showing main driving motor; coolant pump with vertical direct-connected motor; duplicate lever for ram-movement control. Note handwheel for transverse movement, index pin, built-in dividing head, and handwheel for longitudinal movement.

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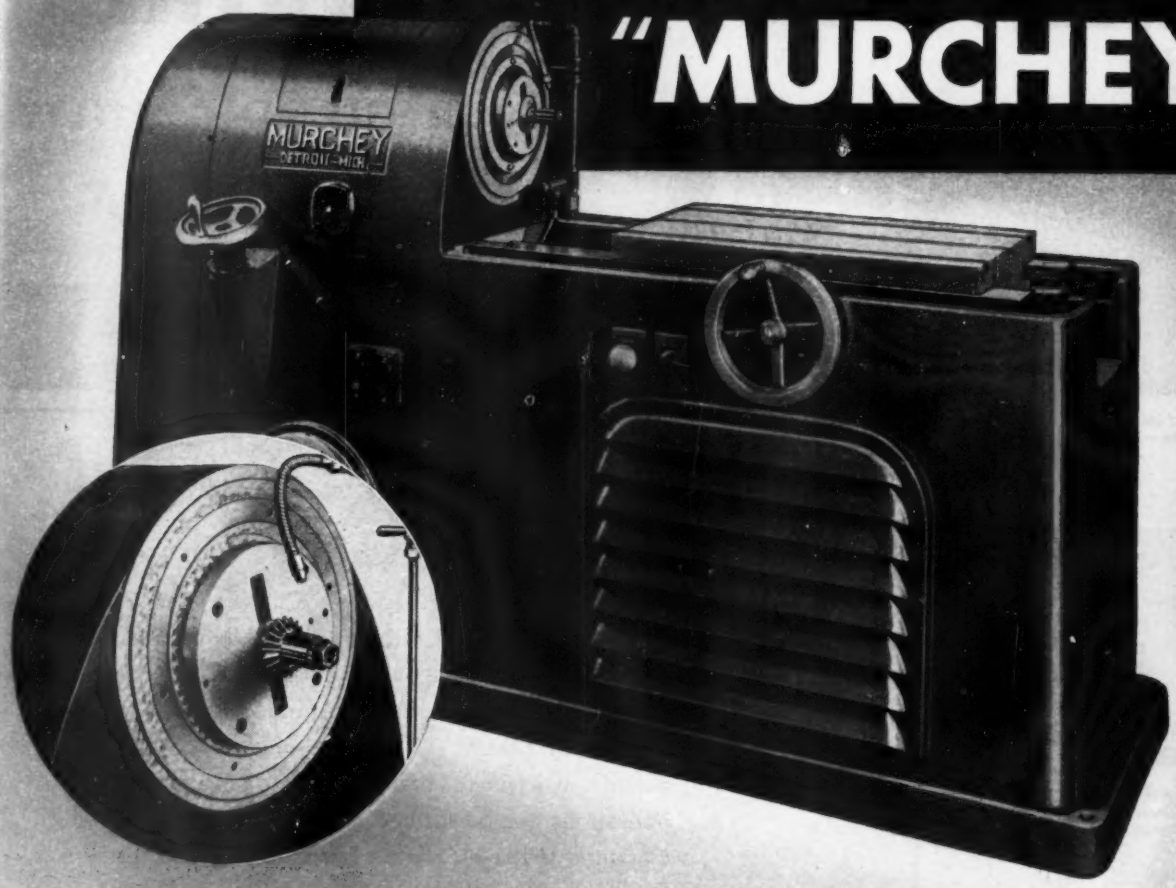

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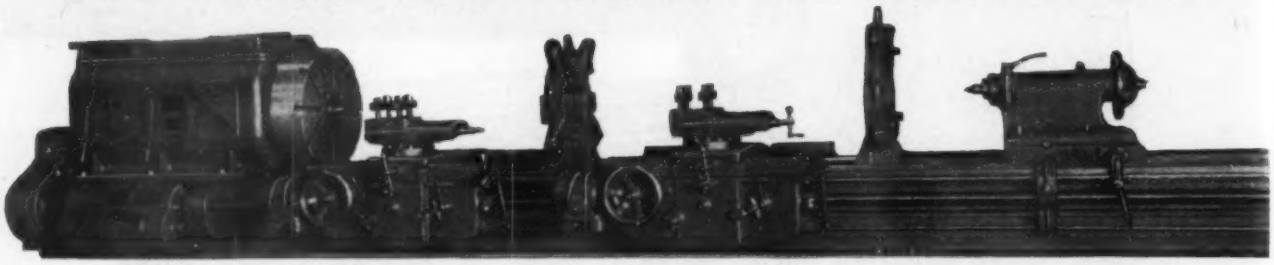

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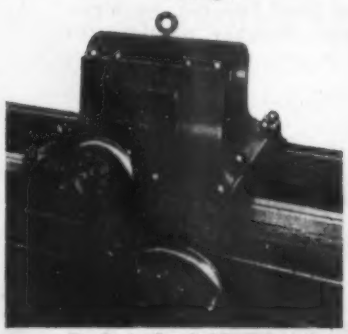

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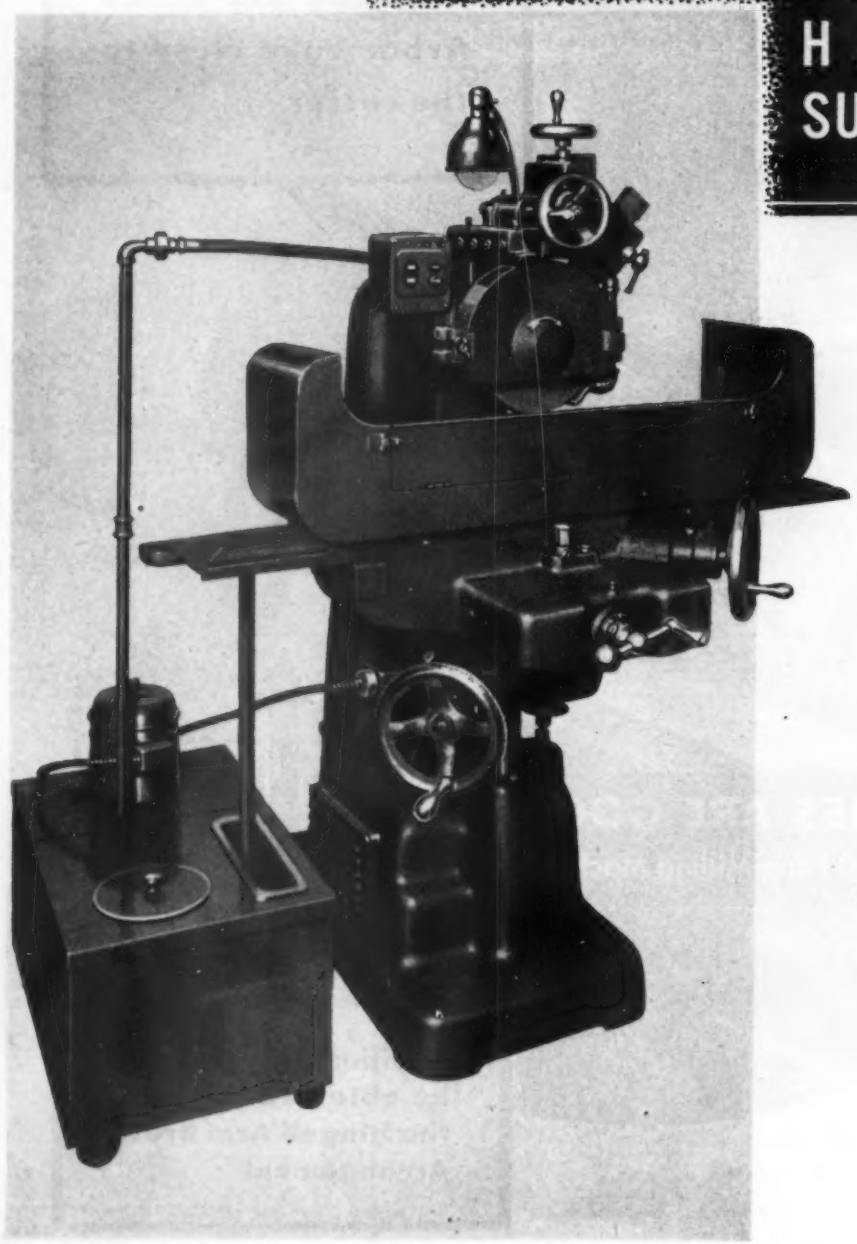

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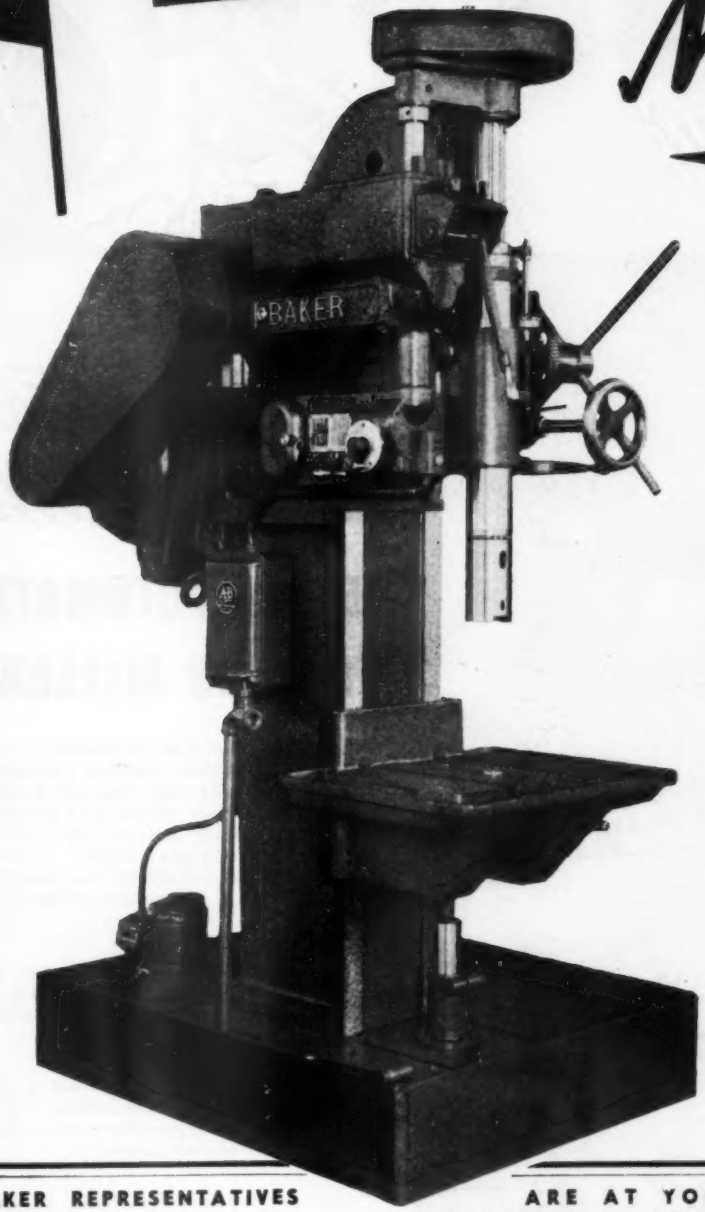

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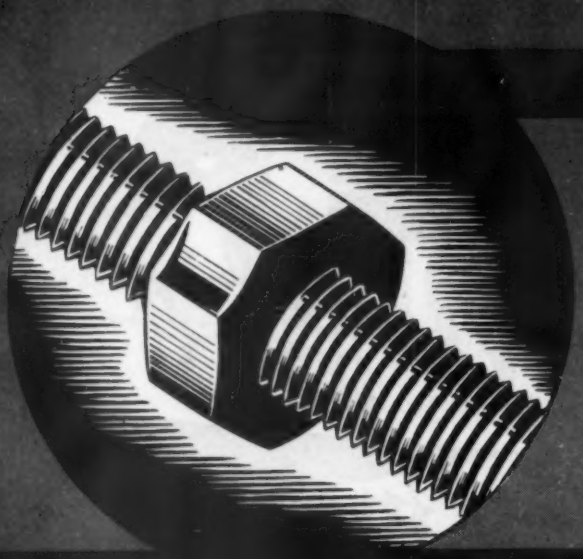
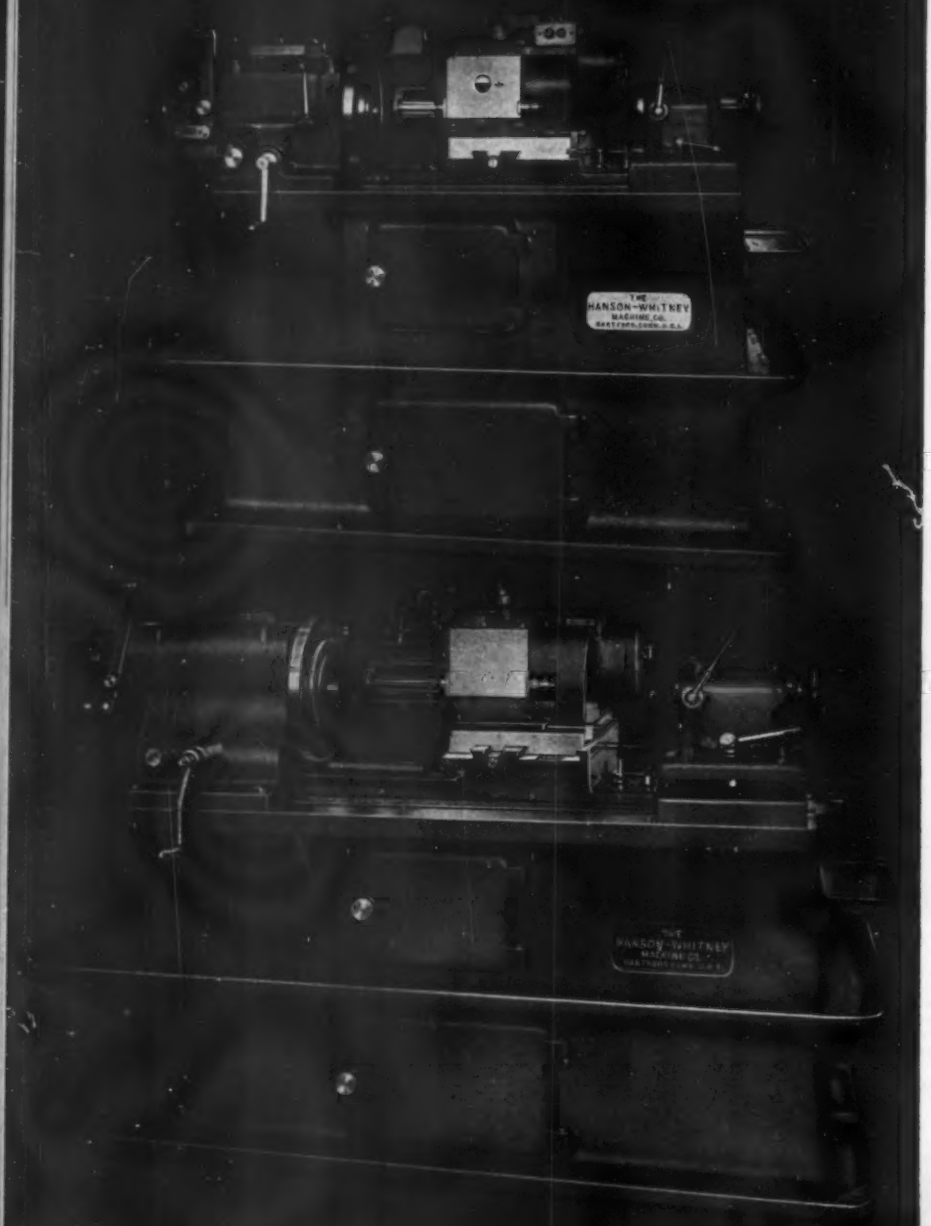
BAKER BROTHERS, INC. • Toledo, Ohio, U.S.A.

DRILLING • BORING • TAPPING

Our Motto Since 1867: "Machines Sturdy and Efficient, as Fine as Can Be Built..."





Production -Plus-With

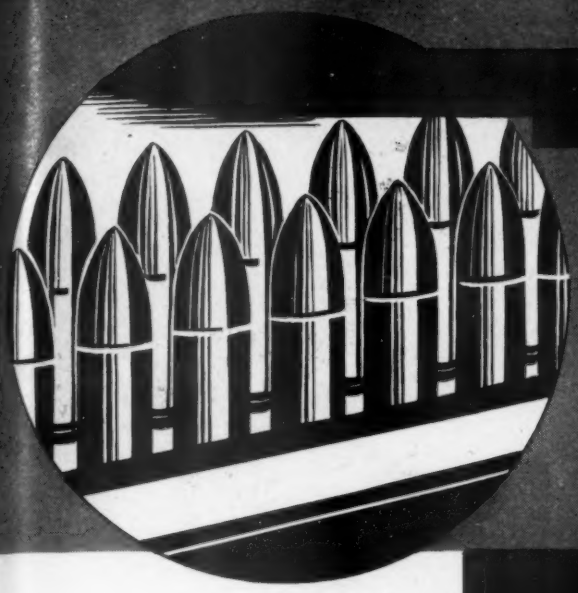
SEMI-AUTOMATIC THREAD MILLERS

These modern, semi-automatic universal Thread Millers produce external or internal threads, right or left hand or taper, with equal facility and precision. The H-W milling method offers the advantages of multiple cutters . . . threading of all lengths within the machine's capacity in a single revolution of the work.

- **Perfect threads are produced at high speed and with maximum operating convenience.**
- **Danger of spoiled work is greatly minimized . . . highest accuracy and precision are obtained.**
- **Permits working of many previously hard-to-thread materials . . . maintaining accuracy, precision and speed.**
- **Produces right or left hand or taper threads . . . with equal facility and precision.**

DESCRIPTIVE LITERATURE ON REQUEST

HANSON WHITNEY



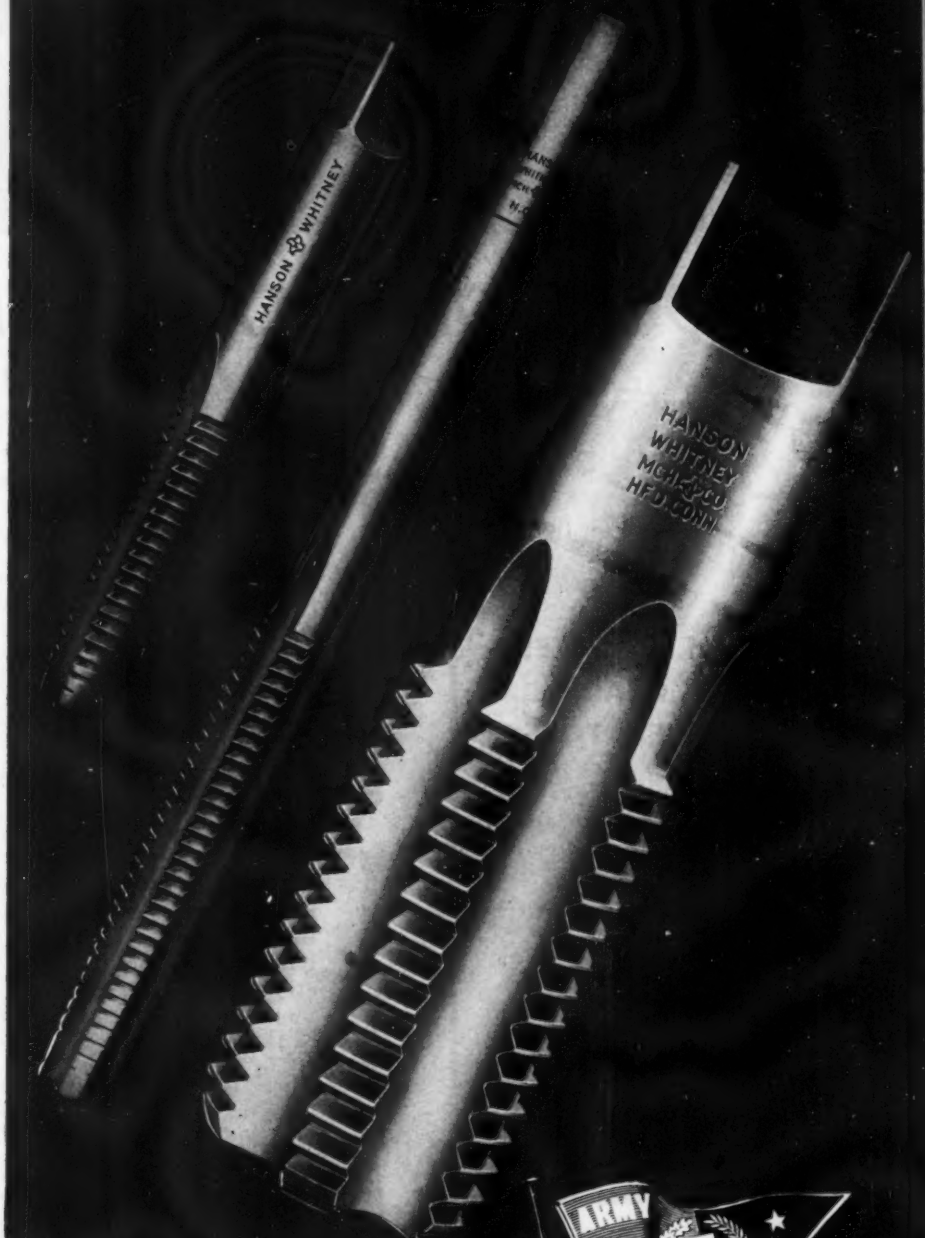
Production -Plus-With

HANSON PROCESS QUALITY TAPS

H-W taps can be depended on to take the bottlenecks out of thread production . . . delivering longer runs between grinds . . . minimizing down time . . . reducing rejects . . . These advantages are made possible by the "Hanson Process" . . . our exclusive method of finishing after hardening . . . insuring uniform grain structure from tip to shank.

- H-W Taps are invariably correct in pitch and form and can be depended on for greater accuracy.
- Every H-W tap is carefully inspected. Note the keen cutting edges and the perfection of finish.
- Precise thread production . . . longer runs between grinds . . . speeded-up production . . . are insured by using H-W taps.
- There's a H-W tap for every tapping problem. Look for the "Hanson Process" emblem in the taps you buy.

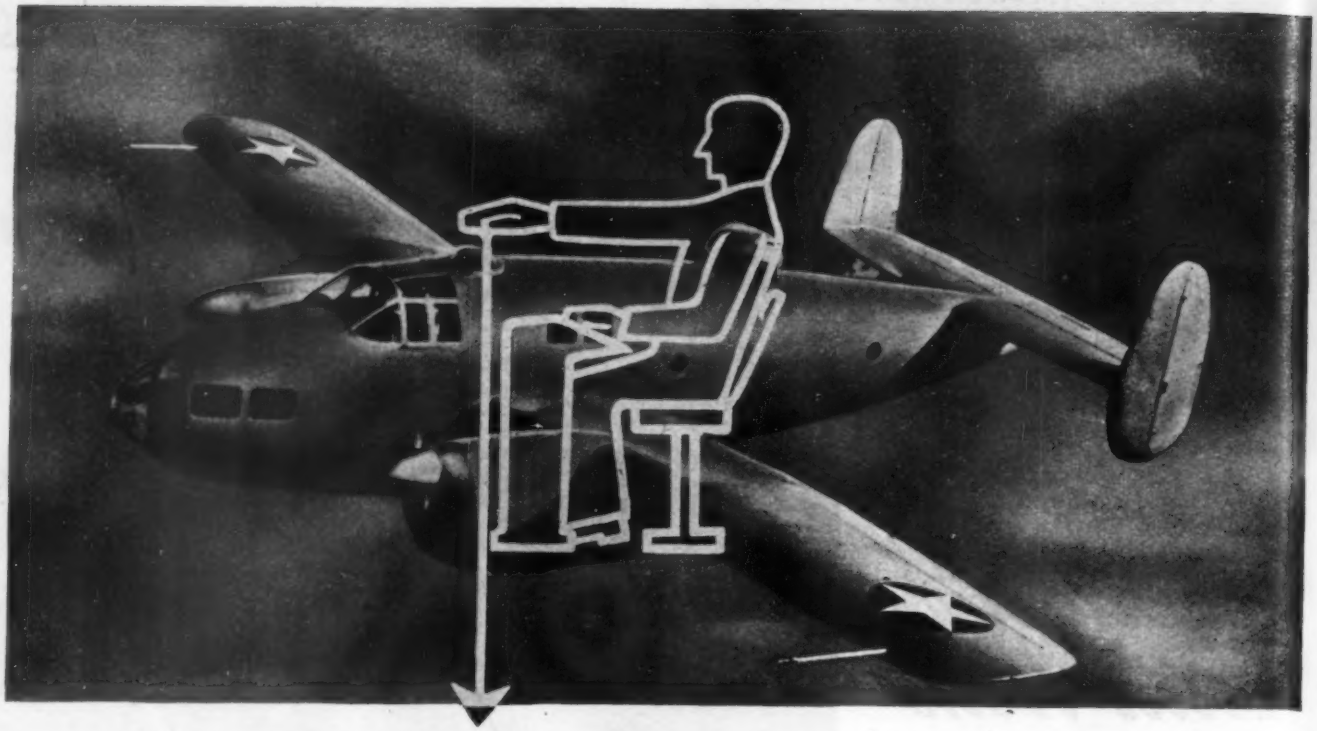
If you have a tapping problem write or wire . . .



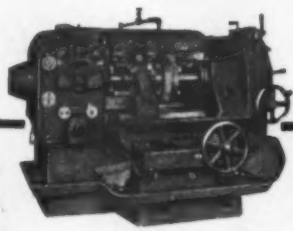
ARMY E NAVY

Y MACHINE CO

HARTFORD CONN. U.S.A



REDUCTION GEARS FOR THE ARMY'S FLYING CLASSROOMS

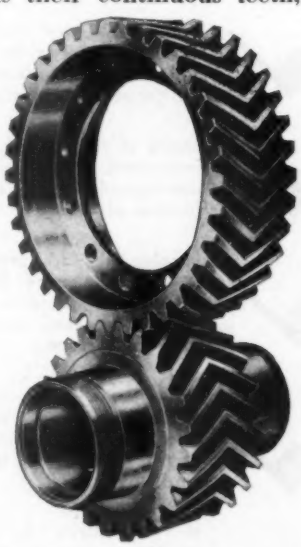


FARREL-SYKES GEAR GENERATORS

Gears of the famous *Gear with a Backbone* design may be purchased from us or, if you prefer, you can cut them yourself . . . right in your own plant . . . on a Farrel-Sykes Gear Generator. These gear generators are made in seven standard sizes for generating gears from 0 to 20 ft. diameter, 0 to 60 in. face, 24 DP to 0.5 DP. *Descriptive literature on request.*

Many fledgling bomber crews are today learning the intricacies of precision bombing in this new Fairchild training plane powered by Ranger, air-cooled, inverted in-line engines.

Reduction gears, for transmitting engine power to propeller at the most efficient speed for operation, are of Farrel-Sykes design . . . the well-known *Gear with a Backbone*. The distinctive feature of these herringbone gears is their continuous teeth, which give them the "backbone" to meet the need for unfailing service.



Greater effective face width provides extra strength and high load-carrying capacity in small space. Combined characteristics of overlap or interlacing of the teeth, gradual engagement and inclined line of pressure, contribute to smooth, quiet operation and maintenance of correct tooth action throughout the life of the gears.

There is a Farrel-Sykes gear and gear unit for every type of service and for any capacity. Farrel engineers will be glad to help you solve your gear problems.

FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN. • BUFFALO, N. Y.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y. -- Branch Offices: New York, Pittsburgh, Akron, Los Angeles

FARREL — The Gear with a Backbone

DO-ALL *Cuts any material*

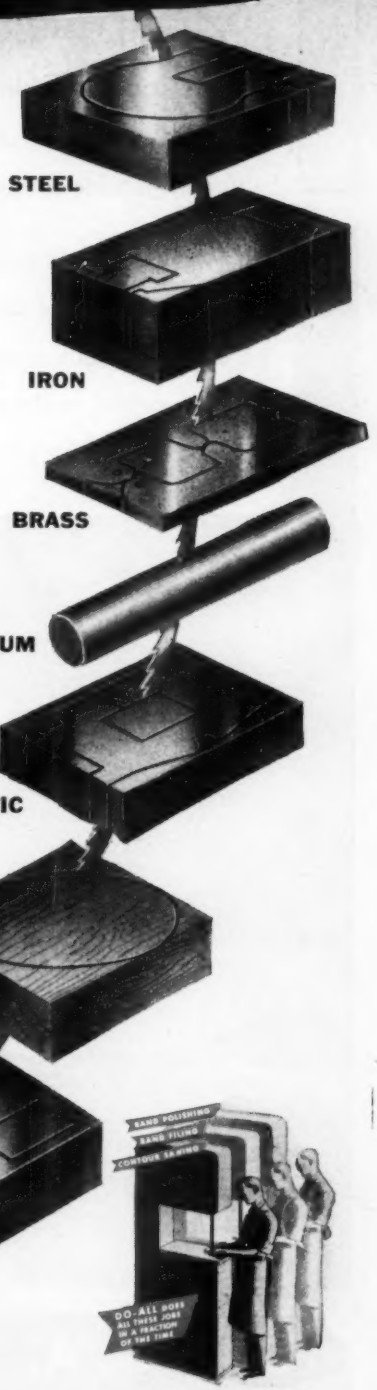
What have you that needs quick, smooth cutting—Metals? Alloys? Plastics? Plymetals? Rubber? Laminated Products? Composition Materials?

Armed with a DO-ALL Contour Machine and a supply of tough-edged DO-ALL Band Saws, you can tackle any internal or external sawing job — flats, bars, tubing, blocks a foot thick, stacked sheets, etc.

Just thread the DO-ALL with the proper band saw and you have ready for instant use Today's Fastest Machining Method—Meets the Challenge for Greater Production.

Six models — built for greater speed and a smoother finish — priced from $1,000 to $5,000 with motors.

Everyone interested in advanced shape cutting methods, should see the 265-page DO-ALL Handbook giving details about this amazing machine. Free copy on request.



CONTINENTAL MACHINES, Inc.

1310 S. Washington Ave., Minneapolis 4, Minn.

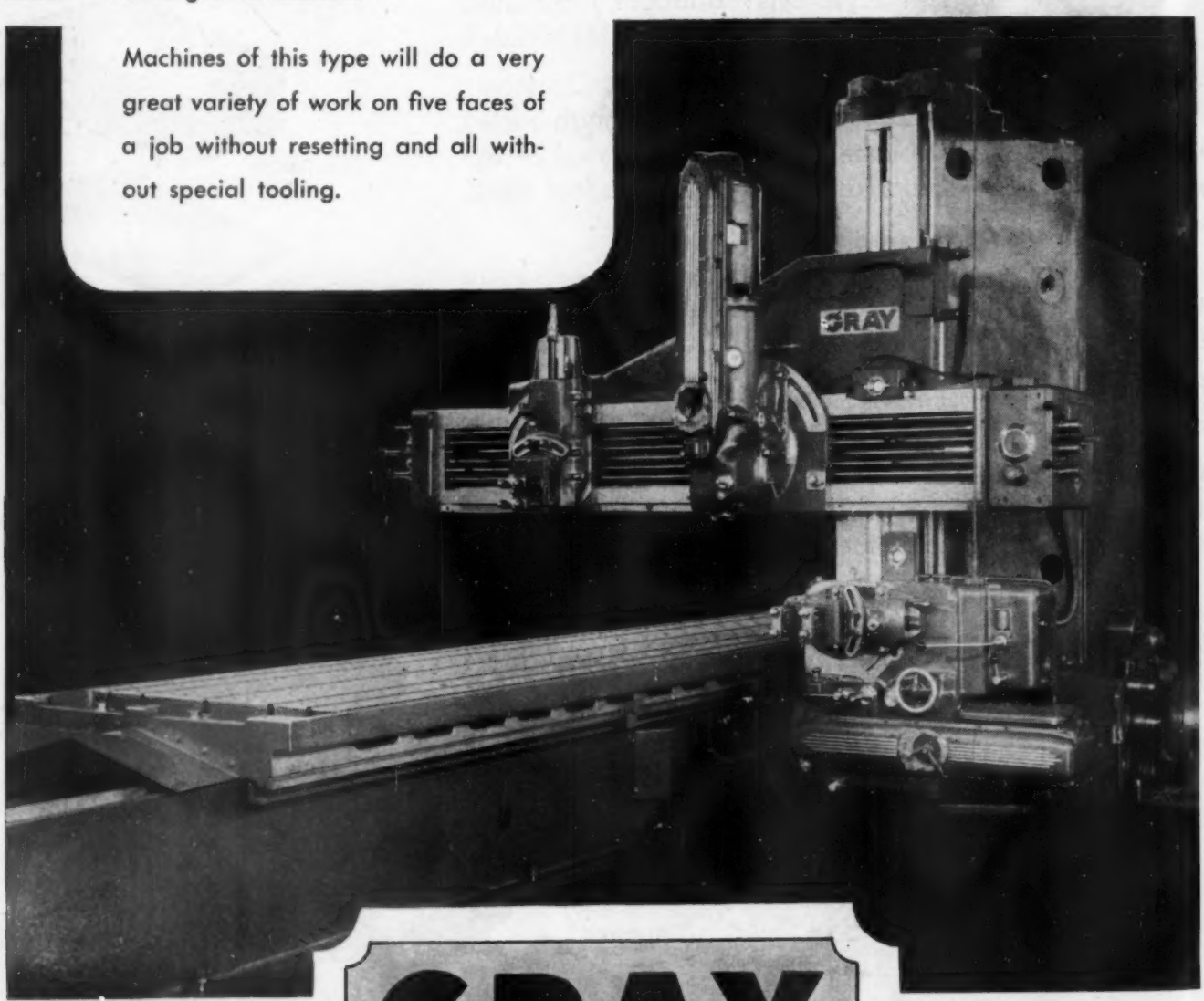
DO-ALL Offices in 25 cities, with a staff of trained engineers to give you quick service on Contour Machines, Band Saws and Files, Gage Blocks and Surface Grinders.

It PLANES *and* MILLS
It BORES *and* DRILLS

•THIS 48" OPENSIDE

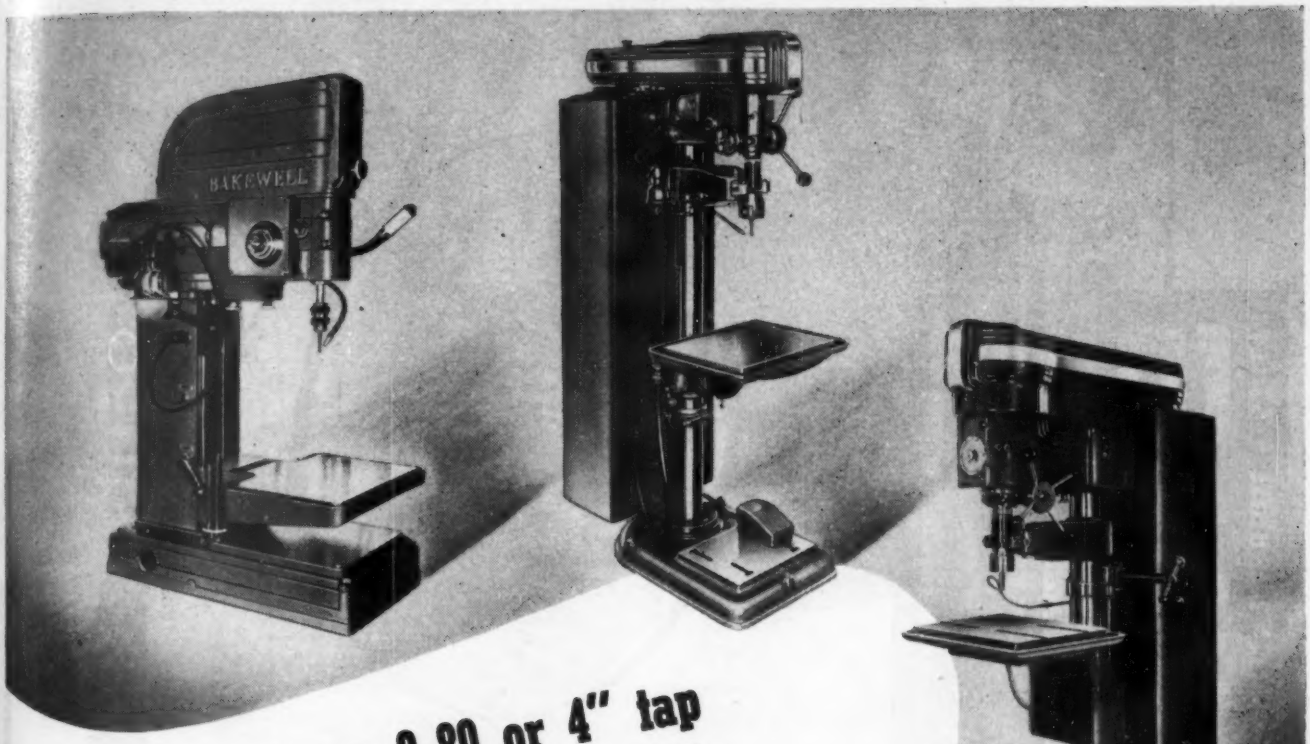
This 48" Openside Milling Planer is equipped with one planer head and one swiveling milling head on cross rail, and combination planer and quill type milling side head, and table arranged for coolant.

Machines of this type will do a very great variety of work on five faces of a job without resetting and all without special tooling.



THE G. A. GRAY COMPANY
Cincinnati Ohio, U.S.A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.



Whether it's an 0-80 or 4" tap you can forget breakage with

BAKEWELL

Tap breakage—material scrapping—lost manhours—all are forgotten with a Bakewell Precision Tapping Machine. The exclusive Bakewell sensitive clutch is adjusted to the safe torsional resistance of the tap. When the tap strikes chips or becomes dull, the clutch automatically slips. The operation halts. The tap is saved. You gain as much as 300% greater tap life. You save irreplaceable time, dollars and material by eliminating rejects formerly caused by taps breaking in blind holes. . . . There's a Bakewell Tapping Machine for any size hole—from 0-80 to 4 inches—that will give you any precision fit in any material with one pass.

Send today for new specification booklet

BAKEWELL MANUFACTURING CO.

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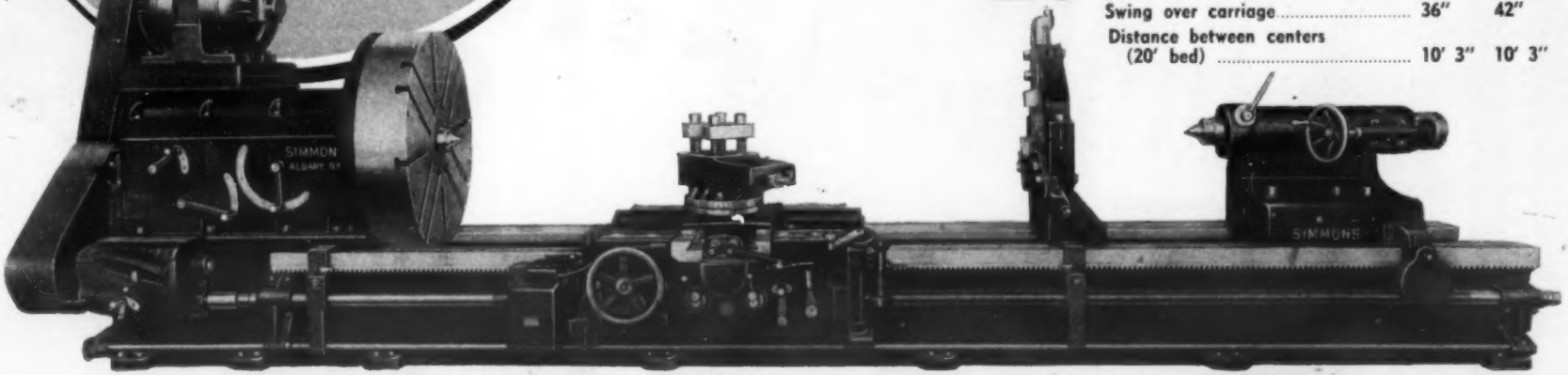
because EXPERIENCE counts

ARMY E NAVY

Into this Simmons heavy duty lathe has gone the experience of more than thirty years. During these years Simmons engineers and mechanics have dismantled, studied and analyzed lathes of every type and make. Out of this vast experience in *Engineered Rebuilding* we have been able to design and manufacture a lathe in 48" and 54" sizes which can meet all present and post-war requirements. The Simmons Heavy Duty All Geared-Head Lathe is not just another machine tool performing heavy metal-working operations, but one into which our engineers have especially designed features which would meet the need of large industries for a rigid, powerful machine. Full details on request. Simmons Machine Tool Corporation, 1759 North Broadway, Albany 1, N. Y.

SPECIFICATIONS	48"	54"
Swing over bed	50"	55½"
Swing over carriage	36"	42"
Distance between centers (20' bed)	10' 3"	10' 3"



SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

Liberty Planers

THE MEDIUM DUTY DOUBLE HOUSING

48" x 48"

Designed and developed for efficient and economical operation on medium class planer work the Liberty 48" x 48" Double Housing Planer is a particularly rugged machine for work of this class.
Listed are a few of the important construction features that make for high production and continued accuracy.

Box type table with "T" slots machined from the solid, extra heavy box type housings bolted and doweled to the bed.

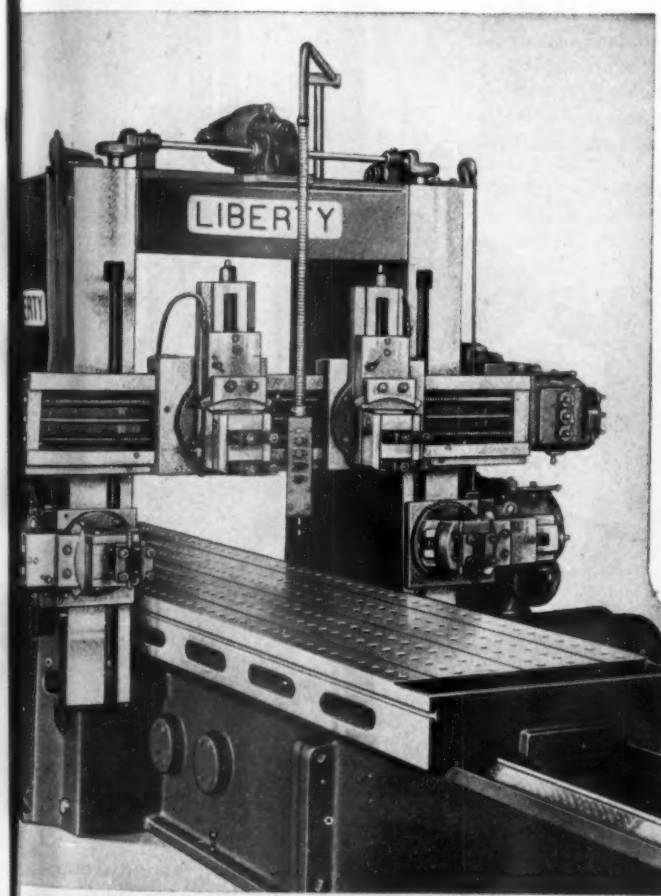
Top cross brace is sturdy assuring sustained rigidity. Deep box type cross rail with individual motor for elevating.

Friction feed and rapid traversing mechanisms for rail head run in oil and are located at end of rail along with simplified control.

Rail heads are provided with automatic pneumatic tool lifters.

Side heads may be moved below table level—out of the way when not in use.

Drive is furnished by a 30 H.P. DC variable voltage reversing motor, 40 to 1200 R.P.M. Generator set and controls operate on 3 phase, 60 cycle 220 or 440 Volt current. Table feeds range from 6 to 172 F.P.M.



FLASH NEWS on DELIVERIES

Fast action when you need a Liberty Medium Duty Planer . . . Deliveries in 30 days after receipt of order. Write today for Catalog No. 155.

LIBERTY PLANERS

1006 WELLER AVENUE HAMILTON • OHIO

A flexible machine that is the last word in simplicity of operation

HI-SPEED
HONING and LAPPING MACHINE

for use with any standard make honing head

Illustrated is No. 0 Machine equipped for 36" stroke with 80" under the spindle.

HONES CYLINDERS up to 24" in diameter . . . with STROKES from 20" to 72" . . .

IDEAL FOR PRODUCTION JOBS INVOLVING:

Aircraft parts . . . Ordnance parts . . . Diesel engines . . . Compressors . . . Pumps . . . Internal combustion engines . . . Steam cylinders, etc.

Speed up war work involving internal cylindrical surfaces by utilizing a HI-SPEED Honing Machine. When used with proper honing head of any standard make, the HI-SPEED machine produces accurate, straight, round, smooth bores—amazingly fast.

Unique positive stop and dwell system makes it possible to stop the spindle without shock or impact at the bottom of each stroke, at any point within the stroke range and hold the spindle without reciprocation, at that point up to 1½ minutes. Ideal for "blind hole" honing and straight line lapping or honing.

All controls are located at the front of the machine at the operator's station . . . No ladders to climb . . . Stroke setting, hone withdrawal, short stroking at any point, changes in speed of reciprocation or rotation of the spindle made instantly from operator's station.

The HI-SPEED Honing Machine is made in 4 sizes, any one of which can be had with strokes up to 72"... Designed for use with any standard make of honing head.

Tell us your requirements—and our engineers will promptly furnish you with complete information, prices and early delivery dates.

NOTE THESE SPECIFICATIONS:

Model No.	No. 0	No. 1	No. 2	No. 3
Stroke (standard)	20"	36"	48"	72"
Working Base Area (standard) .. Auxiliary Tables available	21" x 22"	31" x 31"	31" x 31"	48" x 54"
Height Under Spindle Nose (up) .. Added Height Available on Order.	48"	60"	75"	100"
Spindle Diameter	2¼"	2¾"	2½"	2¾"
Spindle Speeds Through Gear Box	4	4	4	8
Main Drive Motor (standard)	7½ hp	10 hp	15 hp	20 hp
Coolant Pump Volume, Motor Driven	14 gpm	18 gpm	18 gpm	25 gpm
Maximum Bore possible to hone with standard spindle drive motor	10" Dia	12" Dia.	16" Dia.	20" Dia.
Maximum Overall Diameter of Cylinder possible to place on standard base	18"	27"	27"	44"
Floor Area	44"x60"	60"x80"	60"x80"	60"x108"
Overall Height	11'6"	15'3"	18'3"	23'6"

ARMY E NAVY

Over our factory flies the ARMY-NAVY "E"—awarded for excellence in the production of machinery and tools vitally needed to win the war.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Avenue, North Chicago, Illinois

3 Unit-Type Drilling and Tapping Machines Replace Six Standard Machines

Savings in Machining Time =

92.6%

Nine spindle drilling and tapping machine which reduced machining time from 42.31 minutes to 3.10 minutes. Part is crankcase intermediate rear for airplane engine.

91.4%

Six spindle machine. Drills, spot-faces, chamfers and taps. Reduced machining time from 35 minutes to 3 minutes. Part is crankcase main rear for airplane engine.

71.4%

Nine spindle machine. Drills chamfers and faces. Reduced machining time from 3½ minutes to 1 minute. Part is rear crankcase for airplane engine.

Savings like these are common with Barnes' Unit-Type Machine Tools. These are but three of a battery of similar machines installed in the plant of a prominent manufacturer of airplane engines. The parts were formerly machined with standard machines using jigs and fixtures. After installation of the Barnes' Unit-Type Machines, a savings in both production and manpower were obtained. In addition to this outstanding saving in machining time, additional savings were obtained in handling time because several spindles work simultaneously in place of one at a time.

These are three examples of how Unit-Type Special Machines increase production. Perhaps you can save time in a similar way . . . Our engineers will be glad to assist you in your selection of equipment for faster boring, milling, drilling, tapping, reaming and honing operations. Call on them without obligation.

GET THESE PRODUCTION AND TOOLING IDEAS

Free set of eight bulletins describing a better way to get better machines. Each bulletin traces a machining problem from the original study of the part to the final machine design. Each may suggest a more productive tooling set-up that you can use today—valuable file information for tomorrow. Write for Bulletins 943.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Improve your finish on ground parts . . .

. . . by using the NEW

BALANCING WHEEL HOLDER and MODEL K BALANCING STAND

•

•

In manufacturing grinding wheels it is difficult to produce a truly balanced wheel. An unbalanced wheel results in inferior grinding.

THE POPE MODEL K BALANCING STAND and ARBOR and the POPE BALANCING WHEEL HOLDER provide convenient means for quickly and accurately securing a satisfactory balance.

You will be surprised and pleased at the resulting improvement in your grinding finishes.

Suitable as illustrated for the balancing of grinding wheels up to 8″ diameter, ¾″ width, and 1¼″ hole.

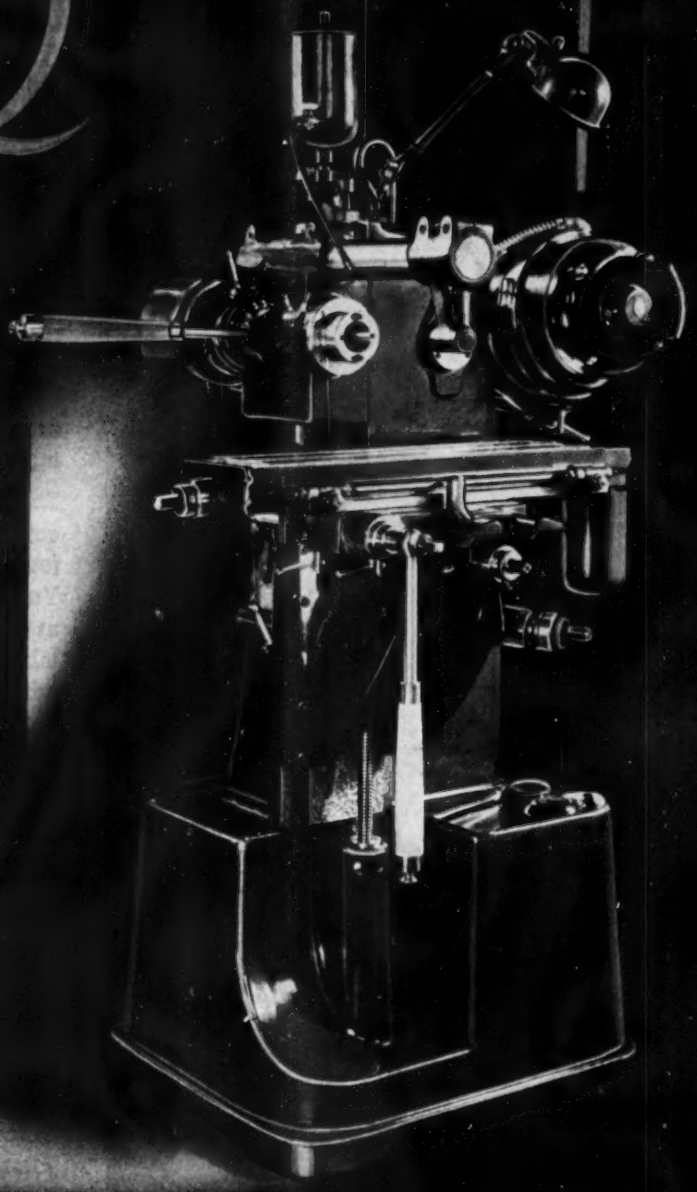
Write for full information and prices.

POPE MACHINERY CORPORATION

261 RIVER STREET **HAVERHILL, MASS.**

Machine Tools and Precision Grinder Spindles

Quality



THE NICHOLS MILLER

EXCEPTIONAL ACCURACY — WITH SPEED AND FLEXIBILITY.

RANGE:

Longitudinal—10"
Transverse—7"
Vertical-Knee—13½"
Spindle Rise and Fall—4½"

STANDARD SPEEDS TO 2400 RPM
SPECIAL SPEEDS TO 5000 RPM

Quick Delivery

W. H. NICHOLS & SONS

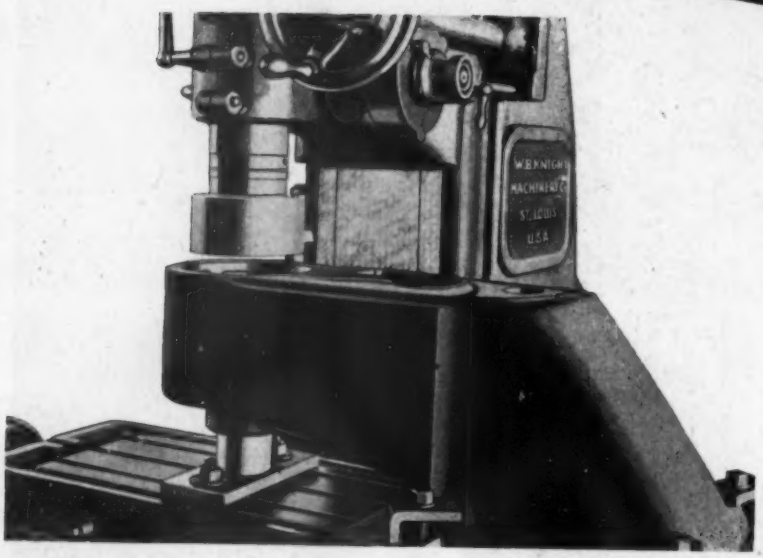
WALTHAM MASS.

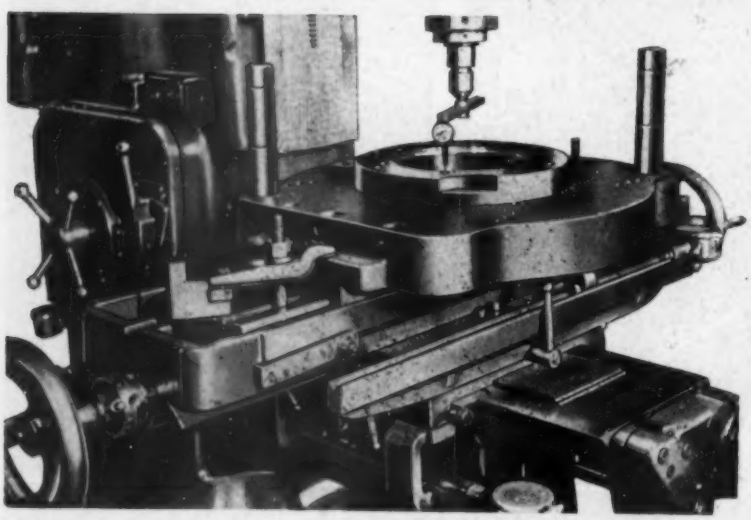
Sole Distributor

NICHOLS-MORRIS CORPORATION

50 CHURCH ST. NEW YORK, N. Y.

YOU ARE EQUIPPED FOR UNUSUAL *Capacity* with a . . . KNIGHT Miller





KNIGHT Millers meet the wide capacity need. There are numerous reasons for this, among them being the fact that they handle large work or small — milling or boring and roughing or accurate finishing cuts.

The swiveling table, too, gives greater capacity — for example, a template was four inches larger than the table travel. Yet it was completely milled and bored at one setting by simply swiveling the table unit around the column to get the additional longitudinal capacity.

Now look at the illustrations to see capacity examples. The large and heavy sub-press die in bottom illustration was accurately bored and recessed without difficulty on the generously proportioned table unit.

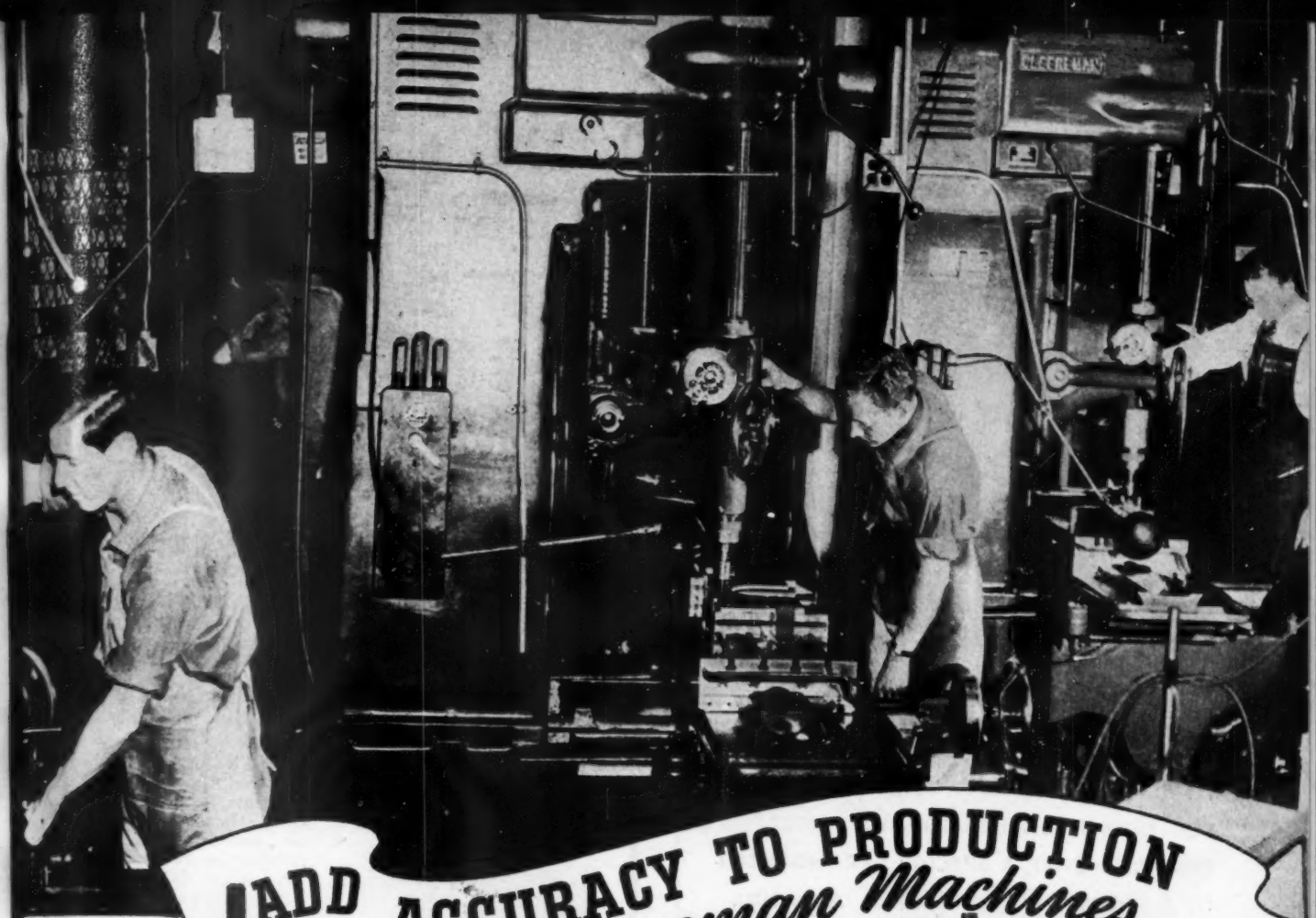
Ample spindle bearings made possible the use of a seven-inch boring head in boring the large diameter hole in the machine casting seen in top picture. At the same setting, the other hole and the recess in the top of the casting were machined.

Another capacity advantage is the 16 changes in speed, in either direction, giving the spindle ample range to meet a wide variety of requirements.

• KNIGHT Millers are fast, compact, complete and convenient to handle, with plenty of power and capacity to do the most exacting jobs you demand of milling machines. THE KNIGHT MILLER IS AN ALL-PURPOSE MILLING MACHINE. Read about it in our Catalog, which will be mailed to you upon request.

KNIGHT VERSATILE ACCURATE RIGID MILLER

W. B. KNIGHT MACHINERY CO.
• ST LOUIS MISSOURI •

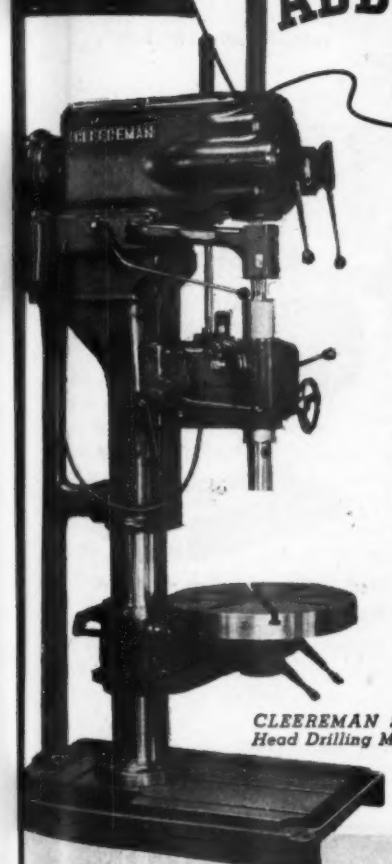


ADD ACCURACY TO PRODUCTION *with Cleereman Machines*

Built by master craftsmen, to precision limits, CLEEREMAN Jig Borers are more than precision machines—they are accurate production machines. Not only are they at work in tool rooms, but also on small lot production, giving duplication of extreme accuracy at low cost.

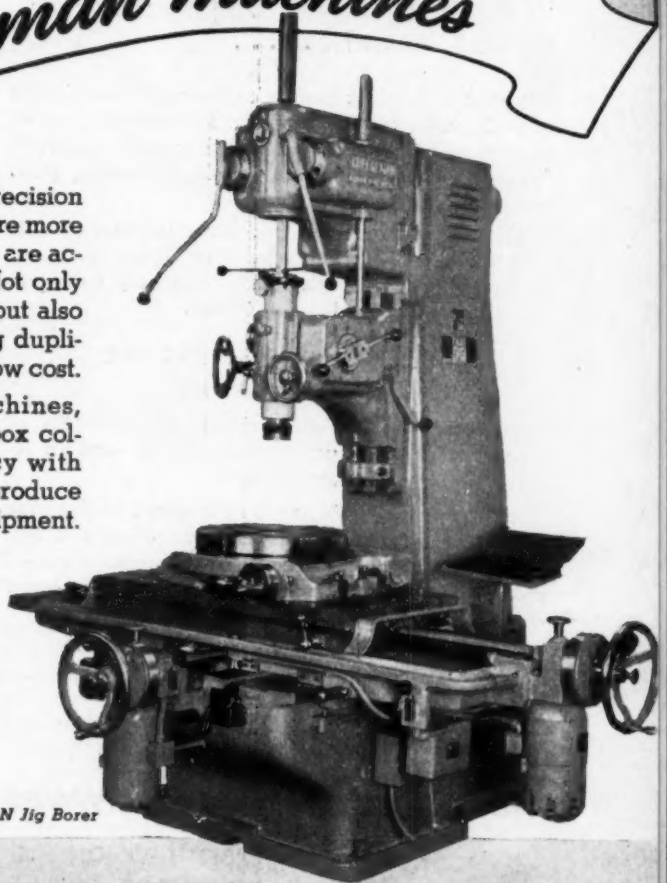
CLEEREMAN Drilling Machines, made in round column and box column types, combine accuracy with great reliability in helping produce vast quantities of vital war equipment.

Write for Catalogs!



CLEEREMAN Sliding Head Drilling Machine

ARMY E NAVY

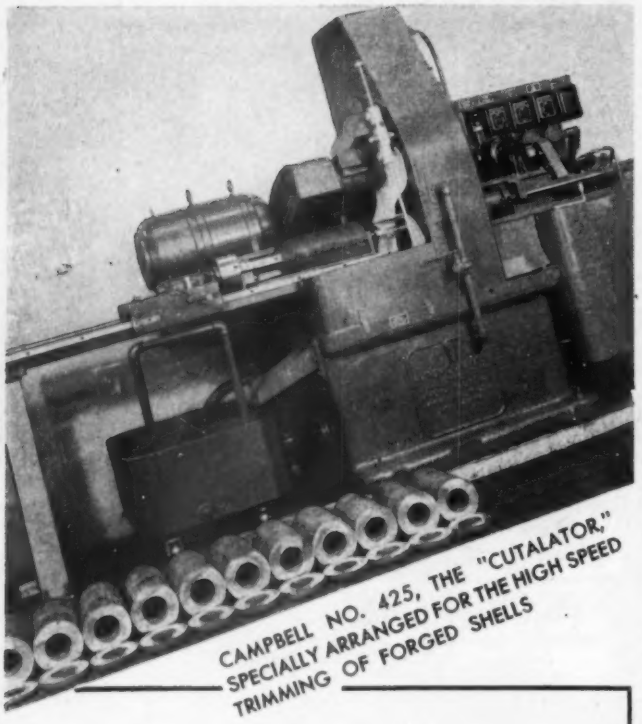


CLEEREMAN Jig Borer

BRYANT MACHINERY & ENGINEERING COMPANY

Associated with **CLEEREMAN MACHINE TOOL COMPANY**

General Sales Offices **400 W. Madison St. • • Chicago • Ill. • U. S. A.**



CAMPBELL NO. 425, THE "CUTALATOR," SPECIALLY ARRANGED FOR THE HIGH SPEED TRIMMING OF FORGED SHELLS

TO SET NEW PRODUCTION MARKS FOR TRIMMING THESE FORGED SHELLS REQUIRED ONLY A SPECIAL ARRANGEMENT OF A STANDARD *Campbell* ABRASIVE CUTTING MACHINE . . . . .

You may find it just as simple to get a better picture of your production cutting—no matter what grades of steel you are cutting, annealed or unannealed; or if you are cutting non-ferrous alloys, plastics, glass or ceramics.

There are CAMPBELL ABRASIVE CUTTING MACHINES for cutting solid bar, tubular and flat stock. In fact, Campbell has a complete line—the only complete line of Abrasive Cutting Machines.

GET CUTTING ESTIMATES FOR YOUR COMPANY

It puts you under no obligation to get an outline of a program for your production cutting—and an accurate estimate of cutting costs.

All you need do is to ask the Campbell Engineering Department for it. State what materials you cut, shapes, sizes, length before cutting, lengths of cut-off pieces and production required per hour. Your letter will receive prompt attention.

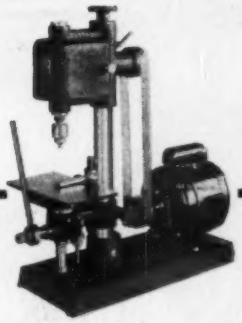
Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

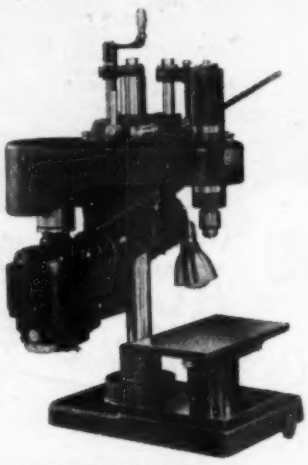
ACCO

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT



HAMILTON MUEHLMATT SENSITIVE TAPPER

A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.

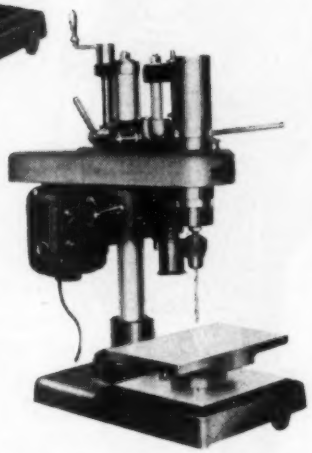


"VARIMATIC"

Built with instrument precision allows instantaneous variable speed adjustment in two ranges. Low range 840 — 270 R.P.M. High range 2900—9300 R.P.M. Drill capacity .004" to 5/16".

MAXI-JR-E

Designed and built for accurately drilling small holes .004" to .250" diameter. It consists of a self contained drilling unit which swings radially on the column and may be locked in any desired position. This extremely flexible small drilling machine may be ganged for sequence operations or to increase production. Spindle speeds from 750 to 21,000 R.P.M.



The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

Write for full particulars on any or all of the machines shown.

The Hamilton Tool Co.
830 NINTH ST. HAMILTON, OHIO

30 MINUTES—FLOOR TO FLOOR TIME

10 holes
5" to 7" in dia.

and 2 holes
10½" in dia.

BORED AND COUNTERBORED IN THIS HUGE DIFFERENTIAL AND FINAL DRIVE HOUSING ON THIS NEW LE MAIRE HYDRAULIC

3-WAY BORING MACHINE

The two end heads, having two spindles each hold cutter arbors (one with three cutters and the other with two), bore and counterbore five holes at each end, ranging in size from 5.118" to 7.125" diameter, while the center head with one spindle bores 10½" diameter hole in large bearing, then reverses rapidly to bore same size hole on opposite side, completing twelve holes in one cycle. All work held within .0012 tolerance.

This is another example of the unusual machines that are engineered and built here at Le Maire to meet difficult situations—how we have enabled manufacturers to speed up their production by having one machine perform work that formerly required batteries of machines to do the same job.

Do you want more production? Perhaps the development of a higher capacity machine—one doing several things at once—is what you should have. Would you like to have us study your problem and suggest an answer?

BUY WAR BONDS

LeMaire TOOL & MFG. CO.

2665 S. TELEGRAPH ROAD △ DEARBORN, MICHIGAN

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

AT The Ohio Crankshaft Company, Cleveland, grinding the surface of counterweights, a vital part of the two-throw aviation crankshaft for radial motors used in such important planes as the B-25 Bomber, the Grumman "Avenger" torpedo bomber, the Curtiss "Hell-diver" and the Army A-25 dive bomber . . . a very precise job with specifications calling for close limits. Another example of the wide scope of precision grinding by ARTER ROTARY SURFACE GRINDERS.

ARTER

ARTER GRINDING MACHINE COMPANY

ARMY E NAVY

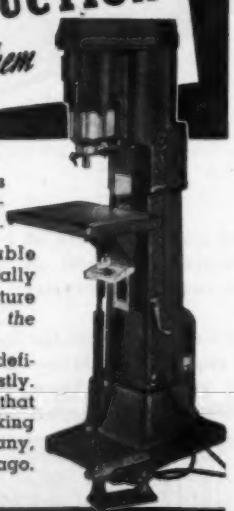
WORCESTER, MASSACHUSETTS • U. S. A.

NO TOLERANCE PROBLEM ON HASKINS

2 FEATURES

Insure Continuous, Trouble-Free TAPPING PRODUCTION

...and only Haskins has them



AIR OPERATION uniformly controls the accuracy of the work. Each part precision tapped *exactly* like every other.

PIECE-PART CONTROL, applicable on many jobs, makes tapping practically automatic. Placing the part in the fixture actuates a micro-switch and—*air does the rest.*

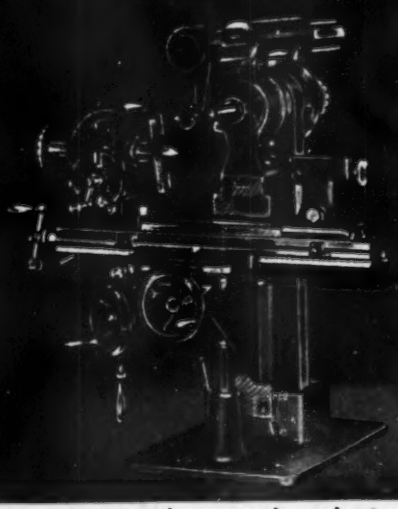
Tapping the Haskins way is faster, definitely more accurate, definitely less costly. Send for TAPPING TIPS—new literature that gives many money-saving, money-making ideas. R. G. Haskins Company, 2761 W. Flournoy Street, Chicago.

HASKINS

HASKINS *Precision* TAPPING EQUIPMENT

AMEs *Precision*

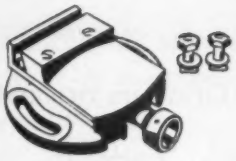
BENCH MILLING MACHINE



For most accurate toolroom and production milling. Large in size and capacity. Cutter head and indexing head take same 1" capacity collet. Separate headstock for vertical milling. Motor and jackshaft drive.

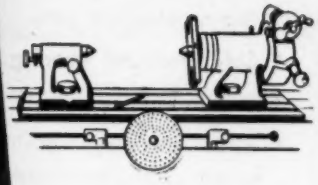
B. C. AMES CO., WALTHAM, MASS.

ABRASIVE
ACCESSORIES



℞

MORE WORK · · BETTER WORK-
FROM YOUR PRESENT MACHINES



Originally designed to increase and improve the work of *Abrasive* Surface Grinding Machines, the Accessories and Attachments listed below are serving efficiently not only on *Abrasive* Machines, but on many other machines of various types. Made to the same high standards as all *Abrasive* Products, they are saving time and boosting production in many machine shops.

EXHAUST ATTACHMENT
WET GRINDING ATTACHMENT
VISE, PLAIN
VISE, SWIVEL
RADIUS TRUING DEVICE
RADIUS & ANGULAR TRUING DEVICE
8" INDEX CENTERS
SEMI-AUTOMATIC INDEX CENTERS
WHEEL COLLETS FOR ABRASIVES

12" & 18" RING WHEEL CHUCKS
CORTLAND SEGMENTAL WHEEL CHUCKS
DEMAGNETIZERS
D. C. GENERATOR *(Belt Drive)*
MOTOR GENERATOR SET
MAGNETIC CHUCKS
HIGH SPEED ATTACHMENT *(Liberty Tool & Gage)*
ROTARY GRINDING ATTACHMENT
12" for Abrasive #34
6" and 8" for Abrasive #3B and #1½

Write for further information and prices on specific equipment

HELP YOUR OPERATORS REDUCE SET-UP TIME AND INCREASE PRODUCTION

ARMY E NAVY

ABRASIVE MACHINE TOOL CO.

Dealers in Principal Cities

EAST PROVIDENCE · · RHODE ISLAND ·

QUEEN CITY GRINDERS

A Complete Range . . . Types and Sizes for Every Service

Here is the equipment you get with

QUEEN CITY GRINDERS

- Two Carborundum wheels — one coarse, one fine.
- Safe, enclosed wheel guards.
- Built-in exhaust.
- Allen Bradley pushbutton switch with overload protection.
- Adjustable and safe work rests.
- Tool tray.
- Water pot
- Adjustable, shatterproof, clear glass eyeshields.

All QUEEN CITY Grinders are supplied fully equipped — ready for immediate use. Built in a complete range of types and sizes, QUEEN CITY Grinders are available in bench, pedestal, and heavy duty box type bases . . . units from 1 H.P. to 10 H.P. Initial cost is well under that of comparative units.

QUEEN CITY MACHINE TOOL CO., 218 East Second St., Cincinnati, Ohio

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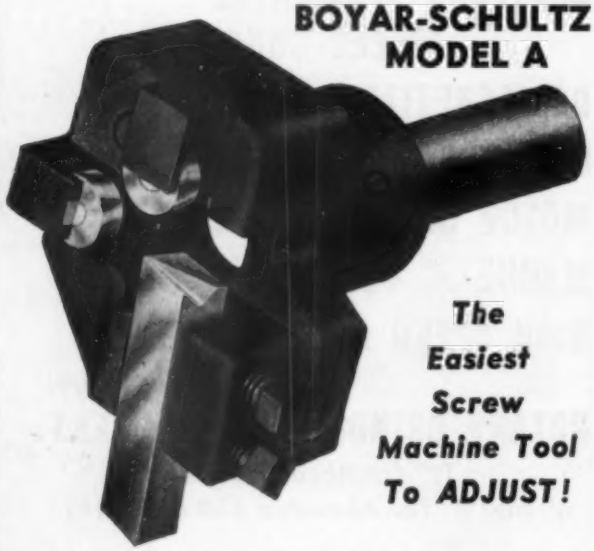
BOYAR-SCHULTZ MODEL A



The Easiest Screw Machine Tool To ADJUST!

- Positive screw adjusting features permit rapid accurate adjustments, reducing set-up time to a minimum.

Tool bit is always tangent to the work. After regrinding, bit can be re-set in record time with a remarkable degree of accuracy.

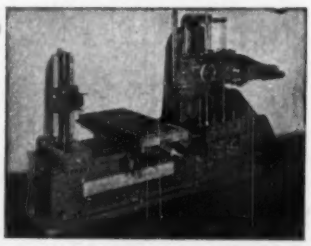
Wide cutting range and special body design permit handling a large variety of shapes and sizes.

Write for Free Folder

BOYAR-SCHULTZ CORPORATION
2109-K WALNUT STREET, CHICAGO 12, ILLINOIS

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

BRIDGEPORT FLOOR GRINDERS

save time and money in snagging and rough grinding

Put your hard jobs on "BRIDGEPORT" Heavy Duty Grinders and cut your costs. Simple in design, rugged, durable and amply powered for all kinds of tough service. They will stand up under abuse, hard work and continuous off-hand grinding.

Spindles are of large diameter high carbon steel and run on deep groove ball bearings. Spindle bearings are oil lubricated with large sumps in each housing.

Made in sizes from 3½ to 15 H.P. Write for complete detailed specifications

The **BRIDGEPORT SAFETY EMERY WHEEL CO.** ***inc.***
1286 W. BROAD STREET — BRIDGEPORT, CONNECTICUT

NO TIME FOR *"Coasting"*...

SPEED PRODUCTION

WITH KENT-OWENS MACHINES!

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.
BUFFALO
Don W. Patterson
CHICAGO
Neff, Kohlbusch & Bissell
DALLAS
Hamilton-Hutter Machinery Co.
DAYTON
Gosiger Machinery Co.
DETROIT
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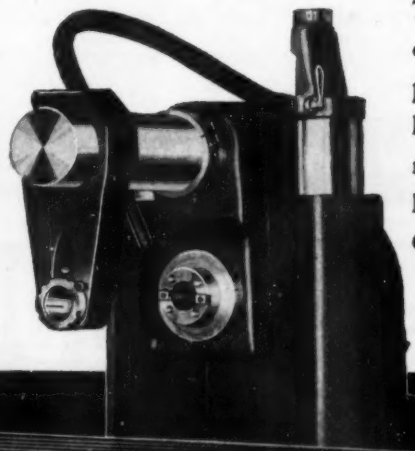
Joseph Monahan
HOUSTON
Oliver H. Van Horn Co., Inc.
INDIANAPOLIS
Oatis-Booth Machinery Co.
KANSAS CITY
Eichman Machinery Co.
LOS ANGELES
Eccles & Davies Machinery Company
Harron, Rickard & McCone
MILWAUKEE
Neff, Kohlbusch & Bissell
MOLINE
John J. Normoyle Co.
MONTREAL
F. F. Barber Machinery Co.
NEW ORLEANS
Oliver H. Van Horn Co., Inc.
NEW YORK
Wilson Brown Company
PHILADELPHIA
Calco Machinery Company
PITTSBURGH
Barney Machinery Co.
ROCHESTER
F. W. Schiefer Machinery Company
SAN FRANCISCO
C. F. Bulotti Machinery Co.
SEATTLE
Star Machinery Company
ST. LOUIS
Blackman & Nuetzel Machinery Company
Clarke Equipment Co.
SYRACUSE
J. F. Owens Machinery Co.
TORONTO
F. F. Barber Machinery Co.
WALKERVILLE
F. F. Barber Machinery Co.

★ In this war, it's an "uphill pull" for industry *all the way* until Victory. Even though we're starting to beat the Axis now... there's still a long way to go... and no time for "coasting"!

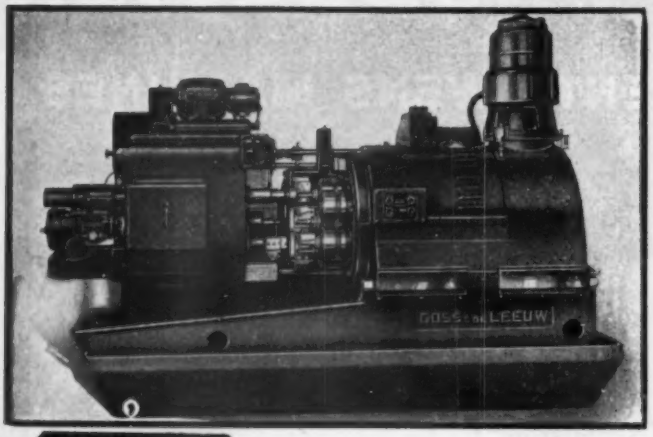
For greater *speed and accuracy* in production... get milling jobs done *right* with Kent-Owens Machines! They're rugged... simple... efficient... designed with practical features that green hands quickly learn to master. Send for latest bulletins. Kent-Owens Machine Co., Toledo, Ohio.

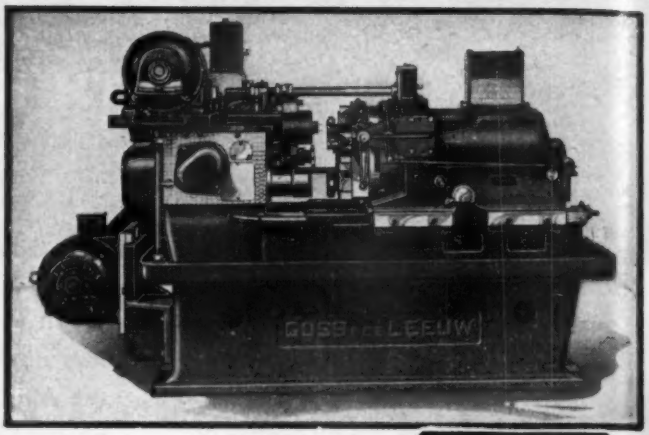


No. 2-20 Milling Machine—
Table, 42" by 12". Table travel, 20"

Call on KENT-OWENS *for Milling Machines*

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Grand Rapids

DRILL AND TAP GRINDERS

Model 10-B

Other Combinations Also Available

Sharpens Taps, 2, 3 and 4 Flute, Right or Left Hand. Sizes No. 6 to one and one half inches.

Sharpens Drills, 2 and 3 Flute, Straight or Taper Shank. Sizes from one eighth to one and one half inches.

GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S.W.

GRAND RAPIDS MICH.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request—Write!

BURKE MACHINE TOOL CO.

CONNEAUT · · · OHIO

How Sundstrand Engineers Use Rigidmils To Meet Special Milling Requirements

A Typical Example of Engineered Production on Small Blade Parts

Perhaps your difficult milling problem can be solved by standard milling machines tooled up to suit the job. Or, it may require a strictly new milling machine design. In either case a thorough study of the job by Sundstrand Engineers will result in an economical productive solution. Here's how they solved one of many special milling jobs.

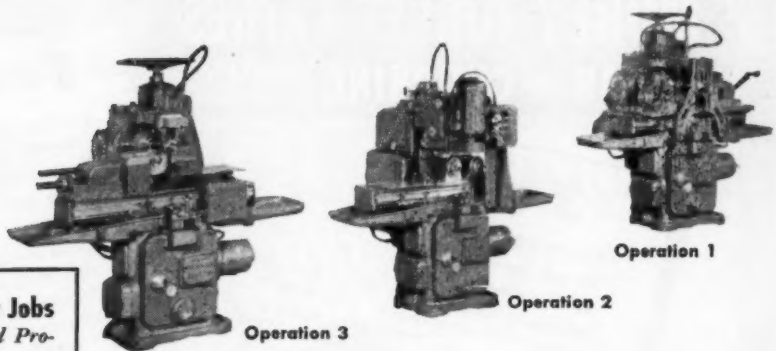
Machine Tooled to Suit Required Operations . . .

This intricate blade part is machined from a tough steel forging. The part is small, tough and of an irregular shape, adding to the difficulty of holding while machining.

TOOLING

1. ***First Operation*** **. . .** Straddle mill both sides. By furnishing "automatic spindle reverse" a "2 way" table cycle could be used and production was increased from 65 to 120 pieces per hour. Furnishing the machine with "automatic spindle reverse" permitted "down cut" milling at both ends of the table. Thus the fixture designs are similar, the cutting action on all parts alike, and the resultant finish and accuracy of the parts more uniform.

2. ***Second Operation*** **. . .** Forming radius and neck on one end of the piece while sizing to length and width on the other end. Form milling cutters on parallel spindles are used for forming the radius and neck. The radius in relation to the neck is held within .00025". The sizing operation is accomplished with a combination of two half side milling cutters and a plain milling cutter all on a vertical spindle located on the opposite side of the work holding fixture. Work was formerly done in *two* operations at a production of 40 pieces per operation per machine. This Rigidmil combines two operations on one machine at a production of 50 pieces per hour.



Operation 1

Operation 2

Operation 3

3. ***Third Operation*** **. . .** Milling the angular and curved surface on the back. Work requires an extremely high finish, as any scratches or tool marks will cause rejection. A No. 1 Hydraulic Rigidmil with an ingenious special roll-over fixture provides a complete automatic milling cycle for this difficult operation. Production was increased from 34 to 70 pieces per hour over the former method of machining.

Only Three Rigidmils Used . . .

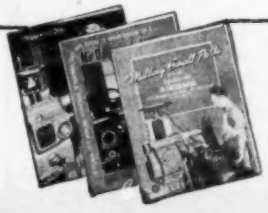
Through unusual fixture design and tooling, only three hydraulic Rigidmils were required for these operations. Machines for operations Nos. 1 and 3 are standard Sundstrand No. 1 Rigidmils tooled to suit the operations. Operation No. 2 is solved with a No. 1 Rigidmil equipped with a special three-spindle head and fixtures to suit the job.

How Sundstrand Engineers Can Help You on Similar Jobs

This is one of many examples of Sundstrand *Engineered Production.* No matter if your requirements are long-run for mass production or short-run for miscellaneous manufacturing, it will pay you to consult our Engineers. Use this service freely. Send complete accurate information on your requirements with each inquiry.

Get These Free Booklets . . .

These interesting bulletins cover the Sundstrand No. 00, No. 0 and the No. 1 Rigidmils. Get the complete information on this versatile line of milling machines. Write for Bulletin 116.



SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

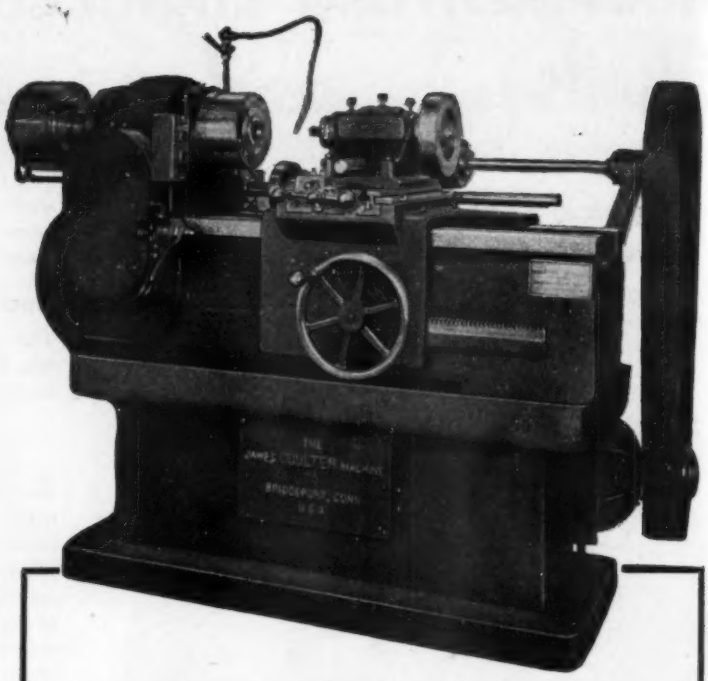
ARMY NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

Keep Ahead of DEFENSE DEMANDS on the PRODUCTION of EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

Send for Descriptive Bulletin giving full information.

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

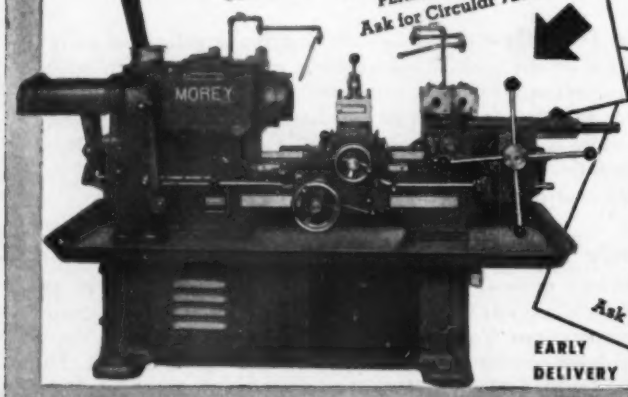
MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY

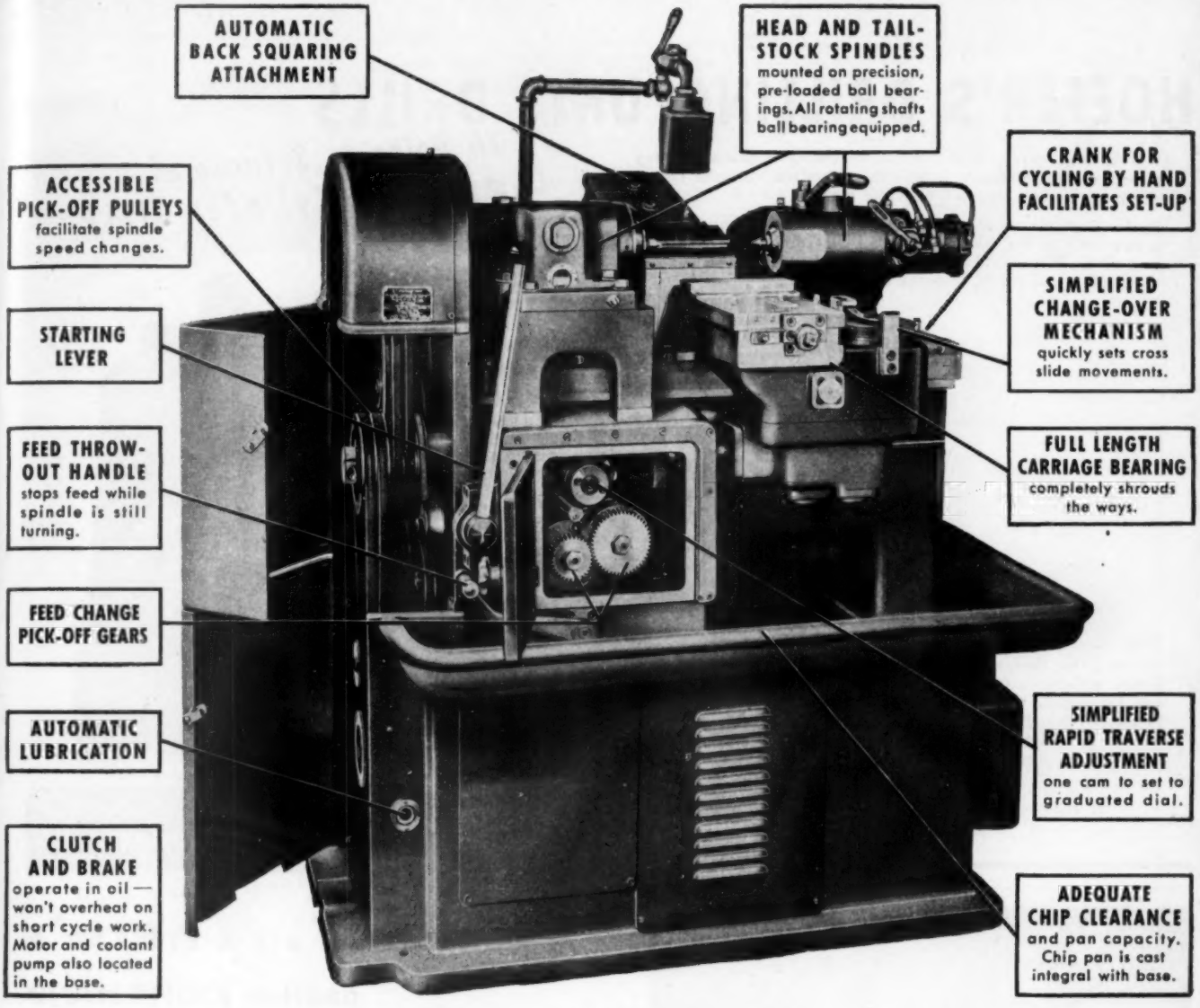


- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK


AUTOMATIC BACK SQUARING ATTACHMENT
HEAD AND TAIL-STOCK SPINDLES mounted on precision, pre-loaded ball bearings. All rotating shafts ball bearing equipped.
CRANK FOR CYCLING BY HAND FACILITATES SET-UP
ACCESSIBLE PICK-OFF PULLEYS facilitate spindle speed changes.
SIMPLIFIED CHANGE-OVER MECHANISM quickly sets cross slide movements.
STARTING LEVER
FEED THROW-OUT HANDLE stops feed while spindle is still turning.
FULL LENGTH CARRIAGE BEARING completely shrouds the ways.
FEED CHANGE PICK-OFF GEARS
SIMPLIFIED RAPID TRAVERSE ADJUSTMENT one cam to set to graduated dial.
AUTOMATIC LUBRICATION
CLUTCH AND BRAKE operate in oil — won't overheat on short cycle work. Motor and coolant pump also located in the base.
ADEQUATE CHIP CLEARANCE and pan capacity. Chip pan is cast integral with base.

Lo-swing IMP LATHE ... A SMALL, FULLY-AUTOMATIC LATHE, WITH UNLIMITED TOOLING POSSIBILITIES

Designed primarily for work demanding high speeds and extreme accuracy, the IMP's sturdy, compact design makes it equally suitable for turning heavier work such as small pistons, bushings, gear blanks, etc.

Noteworthy IMP features are graphically presented in the above illustration. Note the compactness and accessibility of the parts which require a change in setting when changing over from one job to another. Aside from a change in tool blocks, there are only four adjustments to make: *first*, change of spindle speeds (when required) thru pick-off pulleys; *second*, change of feed pick-off gears (when required); *third*, setting of one *graduated sector* in carriage to control movements of the front carriage cross slide; *fourth*, setting of one rapid traverse cam to *graduated dimensions* on the dial.

Another important IMP feature is the extremely long carriage bearing on the ways, obtained thru a unique head and tailstock design which permits the carriage slides to pass under them. Since the carriage is mounted on a flat and "V" way the same as a grinder, "grinding machine accuracy" and exceptionally fine finishes are possible with light cuts using carbide and diamond point tools.

The spindle is mounted on selected precision ball bearings, and speeds up to 5000 RPM may be maintained. The machine cycle is started by a hand lever which may also be used for emergency stops at any point within the cycle and, of course, the machine stops automatically at the end of its cycle. All shafts are mounted on anti-friction bearings and the main parts, including the carriage ways, are automatically lubricated.

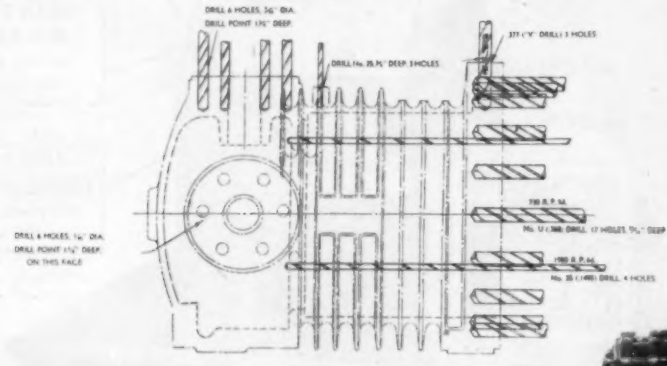
The *Lo-swing* IMP lends itself to practically unlimited tooling possibilities. A Third Slide or Overarm for additional facing or chamfering operations can be furnished as well as a number of other special attachments. Send us your prints or write for complete information about this versatile lathe.

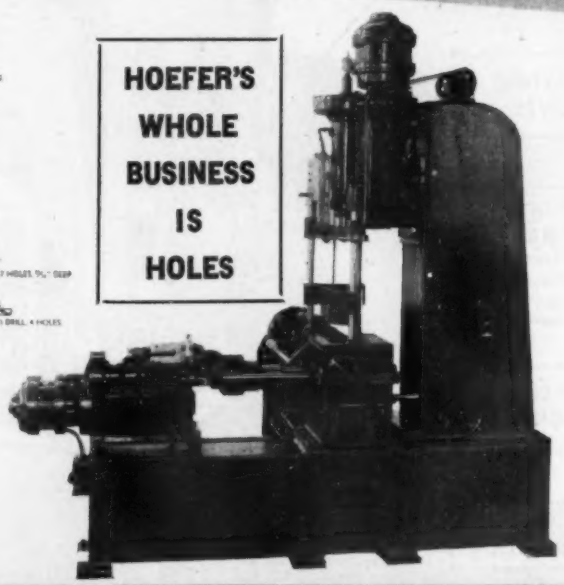
HOEFER'S DRILLING UNIT DRILLS

36 holes in 3 faces of Compressor Cylinder Block

• This three-way machine has central electrical control starting all motors simultaneously as well as centralized hydraulic system which handles all feeds at the same moment.

Hoefer Units are never obsolete. They can be used, with perhaps a new base in the construction of a new drilling set-up, for a new part. These units in service now will be of great value in the coming changeover to peace time production.





HOEFER'S WHOLE BUSINESS IS HOLES

Three faces of the compressor cylinder block were drilled in sizes indicated on drawing—36 holes in all. Drills turned 70' per minute with feeds for large drills—.008" to .009" per revolution and for smaller tools—.004" per revolution. Total drilling time 14 seconds including long rapid approach because of the #25 holes (see drawing) at bottom of cylinder. This of course does not include loading or unloading.

Write today—get details regarding your needs from our experienced engineers

HOEFER MFG. CO. *Freeport, Ill.*

SHELDON BBU-1240 WQ
Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE CO., INC.
4234 N. Knox Ave. Chicago, U.S.A.

Toolmakers . . . here's

another RIGHT HAND

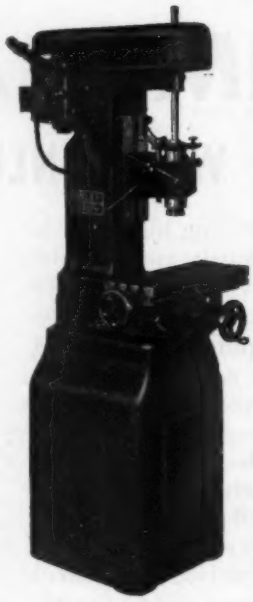


Table Size 7" x 7½"
Table Top to Spindle end 11½"
Floor Space 18½" x 20"

With jobs piling up and everyone clamoring for immediate delivery, toolrooms, machine shops and maintenance departments are busy spots today. Everyone needs another right hand to finish the dies, jigs, metal patterns, models and fixtures that are constantly neded to get jobs done. Well . . . here's another Right Hand . . . the

LINLEY

HIGH SPEED VERTICAL
JIG BORING and MILLING
MACHINE

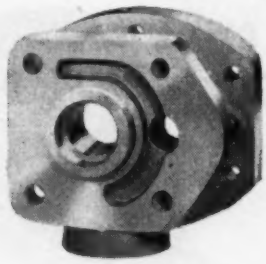
. . . one of the most useful, speedy, precision machines for all-round utility work. It frees larger units for their rated capacity, cuts costs, reduces down-time on production lines..

A "speed for every need," 8 of them to 4250 r.p.m. . . . micrometer setting to eliminate pencil figure errors. Large capacity for small floor space . . . quick changeover. Well worth investigation by every shop.

New Bulletin tells the story

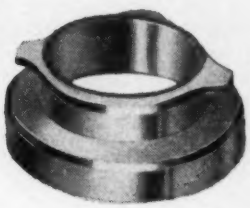
LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT, CONN.

TO MASS PRODUCE PARTS LIKE THESE...



Turn to Turchan

THE ALL-HYDRAULIC DUPLICATOR



THE *forte* of Turchan Followers is high speed production of parts like those pictured here. Any part of irregular or eccentric shape or contour — any part that normally requires time-killing and painstaking hours on a machine tool *can be produced with a Turchan-equipped machine tool from three to twenty times faster.*

Turchan-equipped machine tools do not require highly skilled operators — no matter how intricate the machining job on hand may be. Any fair machine hand can handle one efficiently.

Turchan Followers attach easily to any standard lathe, shaper, grinder, planer or mill. Furthermore, they can be quickly disengaged whenever direct machining is desired. That's why many production men are *Turning to Turchan,* for faster, more efficient output. *Send for our new, free booklet on Turchan Followers today.*

TURN TO Turchan

FOLLOWER MACHINE CO.

Originators of Hydraulic Duplicating Attachments

8251 Livernois Avenue **Detroit 4, Michigan**

GRIND YOUR OWN KNIVES

IN 3 SIZES
90″ 110″ 134″

Note the rigid cabinet base construction and extra wide V way on base and carriage. Has multiple disc clutch type transmission and smooth table traverse with quick, positive reversals.

HELP SPEED PRODUCTION

Knives last longer . . . . cut more keenly, more smoothly . . . when sharpened on this heavy-duty ROGERS NT precision knife grinder. Finely adjusted automatic controls assure keen cutting edges with minimum removal of metal. Built for steady 24 hour service. Requires no skilled operator.

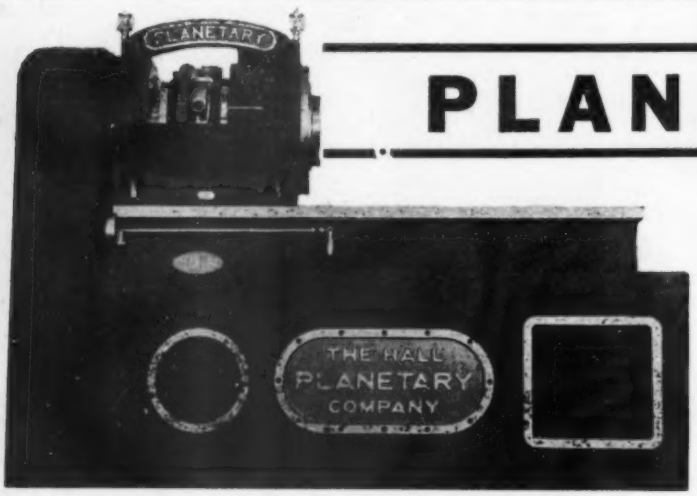
Be independent of outside grinding delays and unnecessary wear on knives. Reasonable shipments. Send for circular NT.

ACCURATE-ECONOMICAL ROGERS KNIFE & SAW GRINDERS

Also manufacturers of circular knife, circular saw and band saw sharpening equipment.

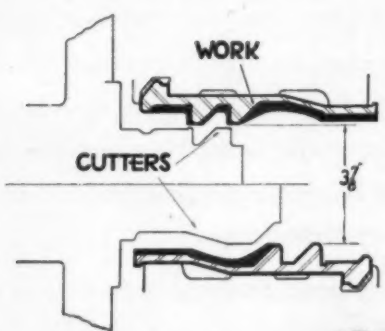
SAMUEL C. ROGERS & CO., 197 Dutton Ave., Buffalo 11, N. Y.

PRECISION QUALITY **ROGERS GRINDERS** SINCE 1887



PLANAMILLING

Internal form-milling on Planamilling is performed on this piece in two operations—reversing the work for the second operation.



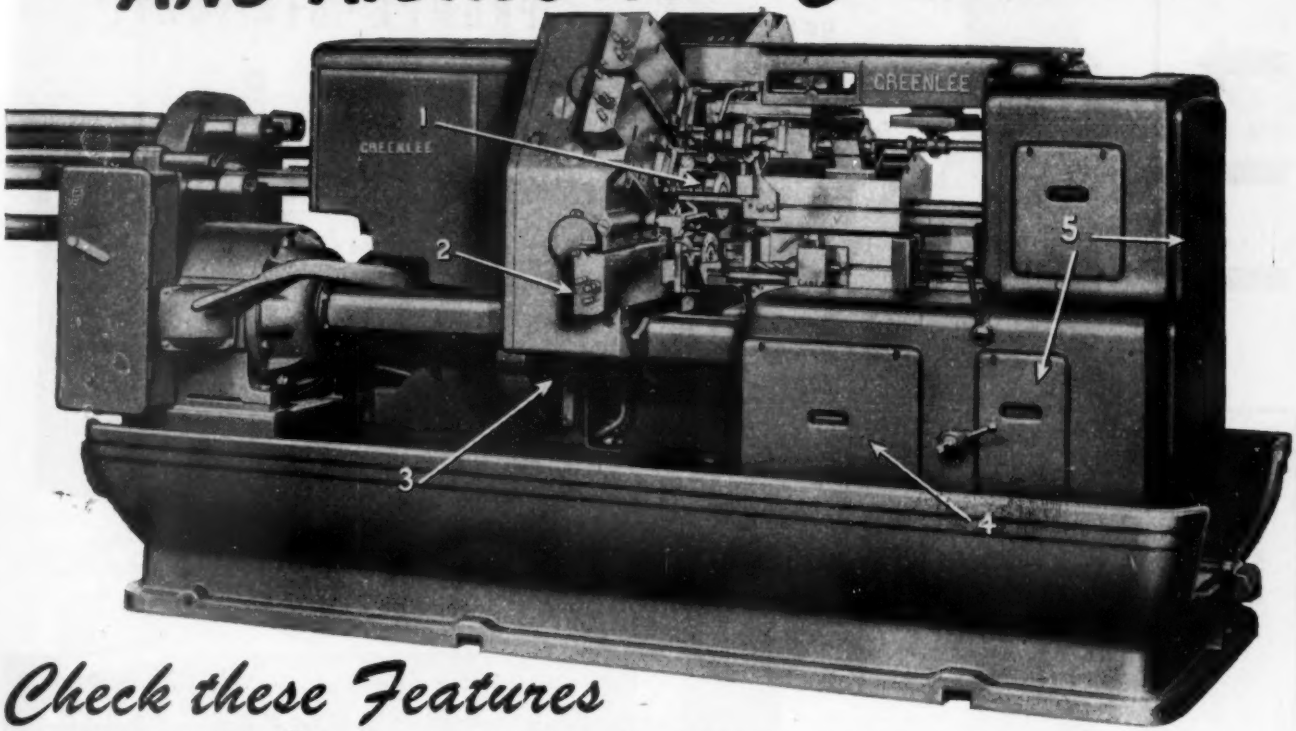
Each Operation in 10 Minutes

Perfect location of shoulders. Concentricity maintained. Let us help you with your milling or threading problems.

THE HALL PLANETARY MILLER

***The* HALL PLANETARY COMPANY**
FOX & ABBOTSFORD AVE. PHILADELPHIA, PA.

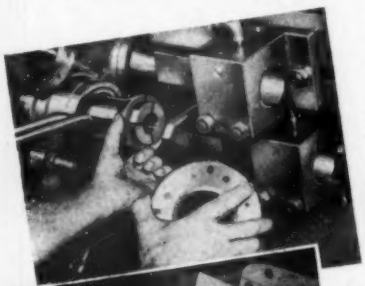
SAVING TIME FOR SET-UP MEN — AND AIDING NEW OPERATORS

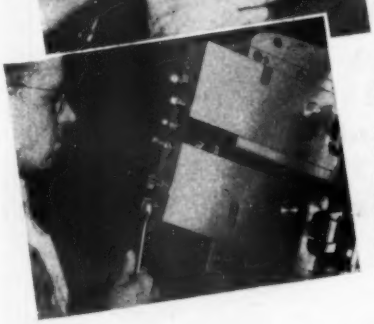


Check these Features

GREENLEE 6-SPINDLE AUTOMATICS

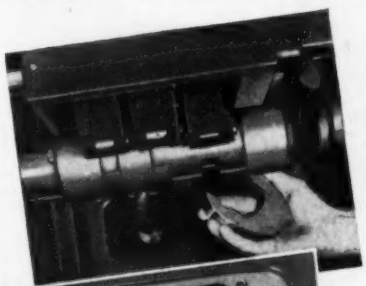
Advantages of accuracy and 6-spindle speed, plus adaptability of machine to efficient war or peacetime production problems, are important factors in the popularity of Greenlee Automatics. The wide-open tooling area and simple adjustments are important time savers for set-up men — important, too, in today's training program for new operators.

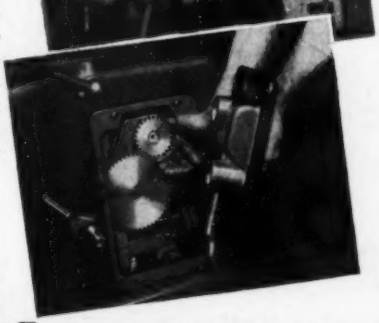




1 ***Collet feature promotes accuracy and saves time*** ... collets close positively on bar fed out to stock-stop. There's no endwise movement of collets, none transmitted to stock, promoting accuracy in length of piece.

2 ***Cross-Slide tool adjustments quick and easy*** ... rigid forged-steel cross-slides have identical tool-cavities. Precision adjustments are simple ... easy to understand. The three fine - thread screws move tool holder in desired direction.



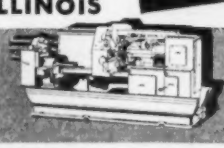


3 ***Simple Cross-Slide camming*** ... cross-slides operate independently, permit better tooling set-ups ... increase production. Cams are interchangeable and eliminate special camming for each job.

4 ***No camming required on Main Tool Slide*** ... adjustments are made in jiffy. Adjustable dog on a graduated worm wheel provides exact settings for tool slide stroke. Scales on tool slide help check stroke.

5 ***Speeds and feeds for production and economy*** ... multi-splined pick-off gears provide wide range of speeds and feeds. Machine, with 1⅝" capacity, has spindle speed range from 105 to 2625 R. P. M. and feed range of .0017 to .0388 per spindle revolution.

GREENLEE BROS. & CO.
1739 MASON AVENUE, ROCKFORD, ILLINOIS

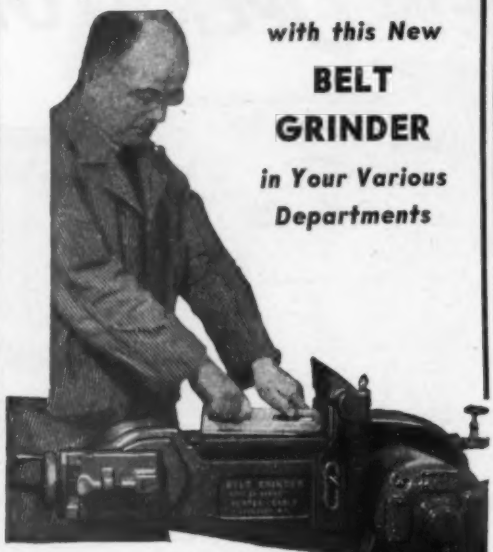
GREENLEE  *Automatic Screw Machines*

You'll Know What "Handy" Means

with this New

BELT GRINDER

in Your Various Departments



PORTER-CABLE

WET - DRY BELT SURFACER

(Model G-4)

• Designed to handle the thousand-and-one smaller items to be surfaced, ground, burred, and polished—for cleaning up chatter, cutter and tool marks—for removing flashing, sprues, gates, fins, saw and shear marks—for generating radii, chamfering, or knocking off sharp corner.

On the production line or as an "at-your-elbow" do-it-all, in every machining bay, assembly department, toolroom, experimental shop or engineering laboratory, a Porter-Cable Belt Surfacer cuts set-up time and machining hours . . . multiplies the efficiency of all workers . . . eliminates waiting time . . . reduces hand work.

The Porter-Cable G-4 may be used vertically or horizontally—the position is easily changed—or without the backing plate when necessary to surface irregular contours. With belt operating *wet*, machine also works on stainless steel, plastics, ceramics, glass.

Actual experience has proved this: Within a few months, the cost of doing without this handiest of grinders will far exceed its original cost.

• The Porter-Cable Wet-Dry Surfacer has been a revelation in many shops. Send for our new booklet, WET-DRY BELT SURFACING, virtually a text-book on the subject. Or call your Porter-Cable representative—his name is in the phone book.

PORTER-CABLE MACHINE CO.

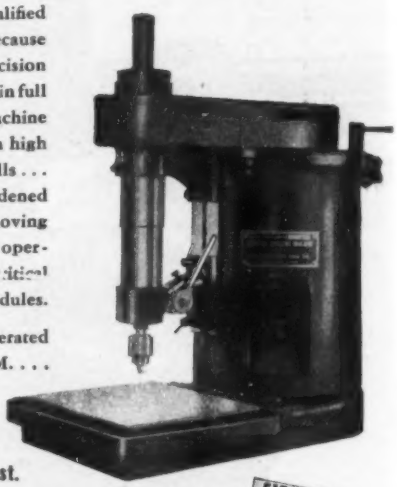
1725-9 N. Salina St. Syracuse, N. Y.

SIGOURNEY M-100

PROMPT DELIVERY!

• Prompt delivery to qualified buyers is possible now because the new Sigourney precision M-100 drilling machine is in full production. This new machine possesses the long proven high accuracy of Sigourney drills . . . sealed ball bearings . . . hardened and ground spindles . . . moving parts enclosed for greater operator safety . . . ideal for critical work on continuous schedules.

The M-100 may be operated at 4000 to 10,000 R.P.M. . . . available in 1, 2, 3 and 4 spindle models.



Detailed Bulletin on request.

THE SIGOURNEY TOOL CO.

Hartford 6, Conn.

Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. West Hartford, Connecticut

LEACH External Grinder

PRICE

$985.00

Fully Equipped

Grinds Work from 3/4" to 11" in length and from 1/8" to 7" in diameter.

Send for Descriptive Literature

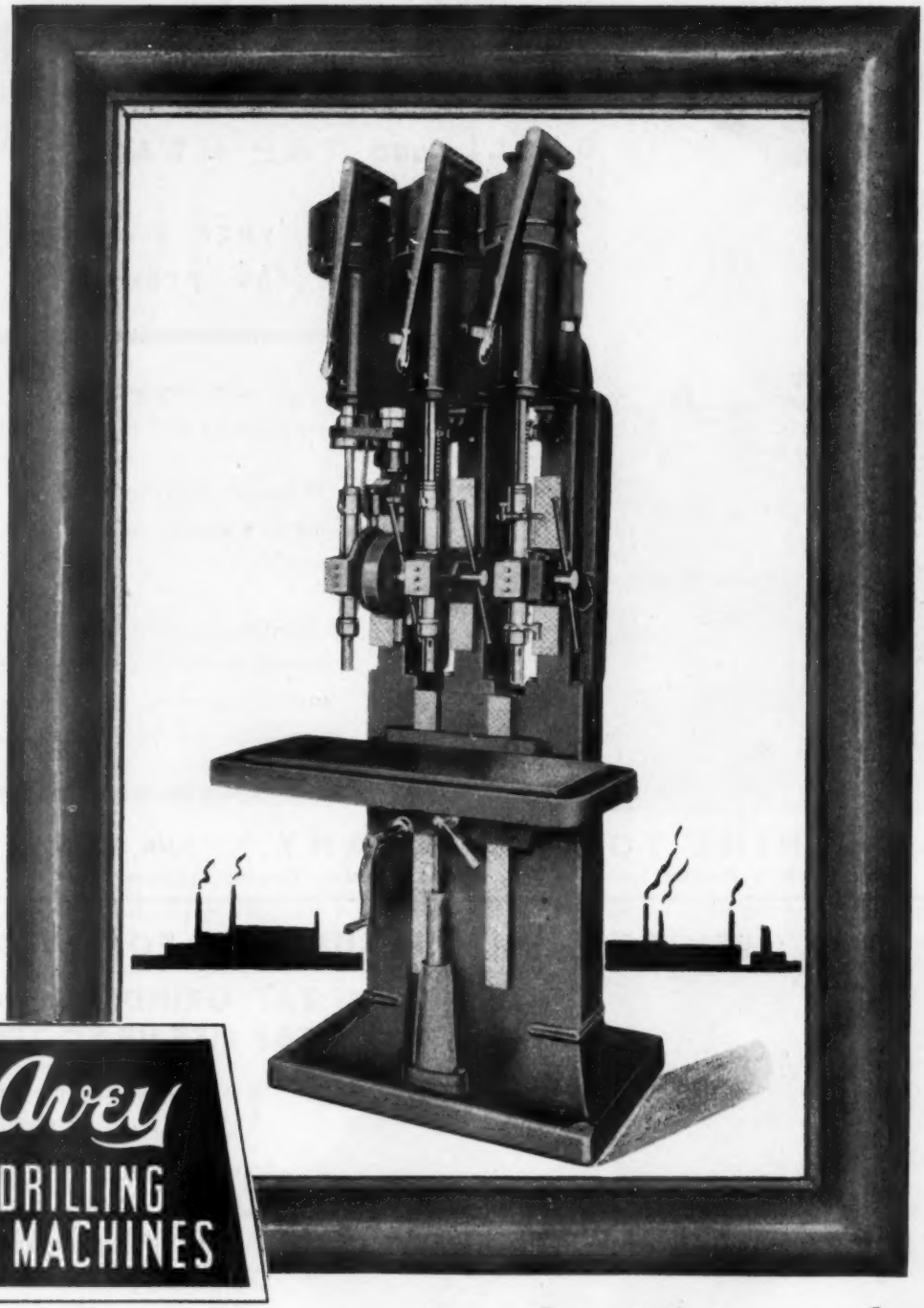
EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.

387 CHARLES ST. PROVIDENCE, R. I.

Agents in all Principal Cities Throughout the World



Avey
DRILLING
MACHINES

. . . In the Picture for 1943

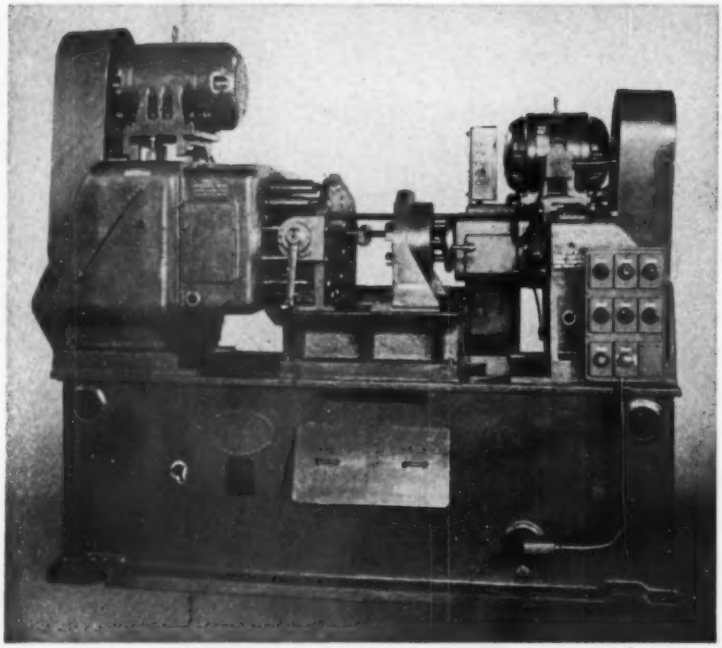
Make sure it is in your production line for 1943. Avey Drilling Machines give longer operating hours, smoother performance and lower maintenance. They'll do your war job now, your peace job later. We illustrate the Avey Type MA-6 in No. 2 size *(Capacity in cast iron, 7/8″)*. No. 3 size *(Capacity in cast iron, 1 1/4″)*. One to six spindle units, either size. Six speed machine, two speed motor, three mechanical changes through gearing, 8 to 1 speed range. Push button control. MA-6 illustrated, has three spindles, the Aveymatic Feed, Hand Feed and Tapper.

AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO U. S. A.

CINCINNATI · OHIO

Avey DRILLING MACHINES

Let Buhr MULTIPLE SPINDLE DRILL and TAP HEADS



put your idle machines on the production line

A base and motors brought out of storage and retooled with a holding fixture;

A 19-Spindle Tapping Head on Left Side and an 8-Spindle Tapping Head on Right Side.

All spindles are provided with vertical adjustment to secure proper tap depth, and each head has an oil pump for positive lubrication and freedom from wear.

BUHR MACHINE TOOL COMPANY, ANN ARBOR, MICH.

Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

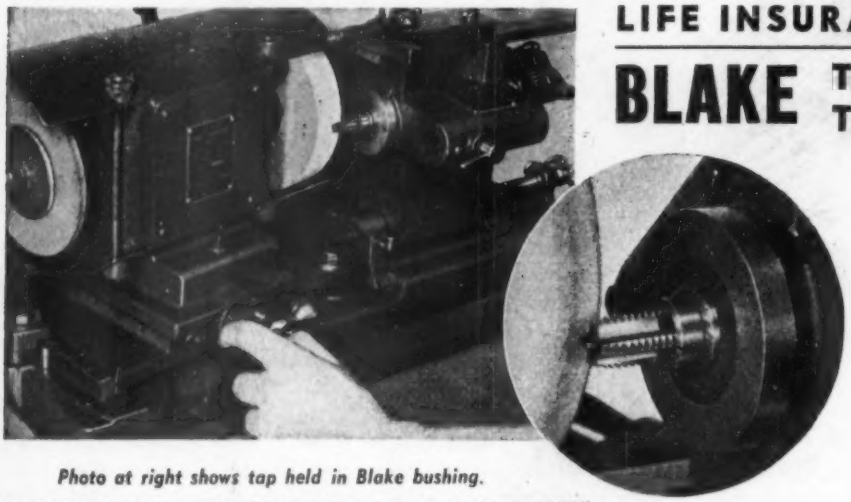


Photo at right shows tap held in Blake bushing.

LIFE INSURANCE FOR EVERY TAP

BLAKE TAP GRINDERS INCREASE TAP LIFE UP TO TEN TIMES

TAPS are usually discarded as soon as they become dull. No longer is this necessary. Now, with a BLAKE Tap Grinder on the job, taps can be sharpened and re-sharpened many times. They can be sharpened as soon as any dullness appears — before work is spoiled — before tap breaks off in the hole. Often taps which are kept sharp in this way will last as much as ten times longer than before!

BLAKE Grinders will sharpen the chamfer on right or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes. Capacity — No. 0 to 2". Investigate life insurance for your taps — the premiums are low — the dividends high!

Please send folder giving complete details on the Blake Tap Grinder.

NAME ..... TITLE .....

COMPANY .....

STREET .....

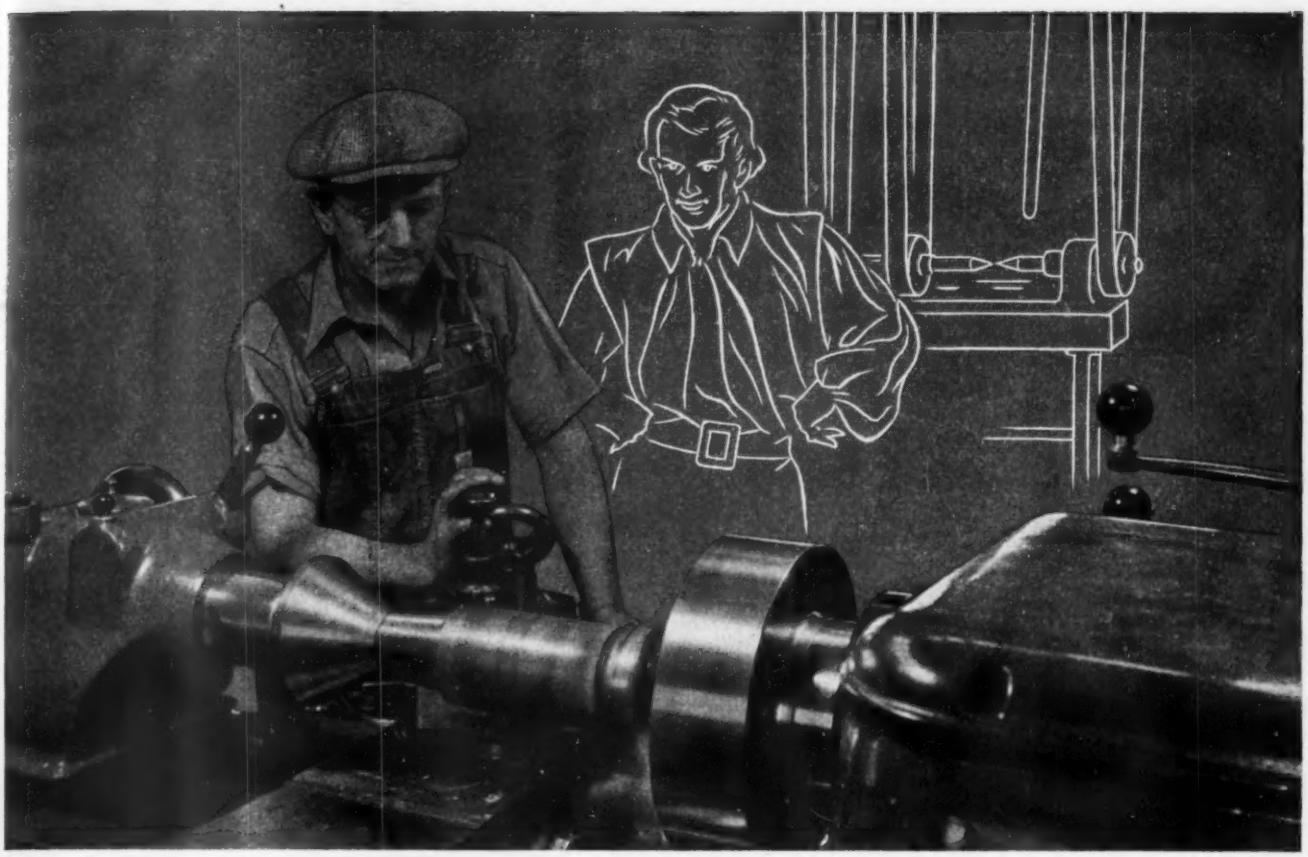
CITY ..... STATE .....

A.M.

EDWARD BLAKE COMPANY

614 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

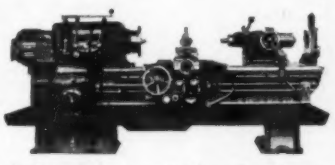


If a colonial craftsman saw today's operation of an AXELSON LATHE

Years ago there was no need to machine a heavy propellor to such a fine balance that it would move if a man blew his breath on it. No planes existed that could fly with almost the speed of sound, nor were there instruments and apparatus so exact in their operation that their working parts were measured in terms of thousandths of an inch or a fraction of a wave length.

If a visitor from the past dropped in he would marvel at the smooth operation of an Axelson Lathe — which today, along with other types of cutting tools, makes possible our present Age of Precision.

But Axelson Lathes did not reach their present stage of development overnight. They are the product of intensive research, design, and perfection in use — over a period of twenty-five years. You don't have to go back to the perspective of a man from the last century to appreciate the engineered ability of Axelson Lathes to turn out volume precision products under the heaviest cutting conditions. Any man who knows machinery, who demands the most advanced design and improvements in his lathes, will accept and specify for his plant quality no less than that offered by Axelson.



Axelson Lathes' materials and workmanship are guaranteed — complete assurance to the purchaser of unexcelled service. Manufactured in 14, 16, 18, 20, 25 and 32 inch sizes, in varying length.

AXELSON MANUFACTURING COMPANY
6160 South Boyle Ave., Los Angeles, Calif.
(P. O. Box 98, Vernon Station)
50 Church Street, New York City, N. Y.
3844 Walsh Street, St. Louis, Missouri

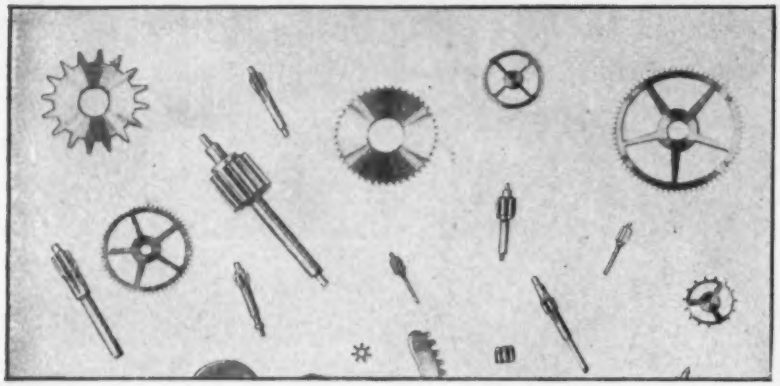
Buy More War Bonds For Victory

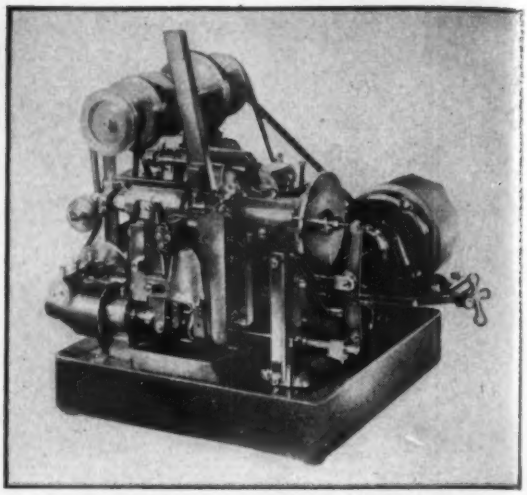
AXELSON LATHES

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

DEPENDABLE FOR OVER A QUARTER CENTURY

WALTHAM PINION AND GEAR CUTTERS





Cut small, fine pitch parts in quantity to closest precision . . .

These machines—available in single-cut, multiple-cut and magazine-fed types—assure tool room standards of accuracy in cutting such parts as the typical cones shown here. These small parts—for use in watches, instruments, time fuses, etc.—can be produced easily, quickly and conveniently on Waltham machines without skilled help. Only straight teeth can be cut.

Waltham offers these machines for either countershaft or individual motor drive.

Write for complete, detailed specifications

TYPES OF MACHINES

SINGLE CUT PINION MACHINES
Only one cutter employed. Blank is positioned and machine started by hand; other movements are automatic.

MULTIPLE-CUT PINION MACHINES
Used for second or third cut; employ two or three cutters.

MAGAZINE-FED PINION MACHINES
Fully automatic (except for loading); used for continuous production of one kind of pinion.

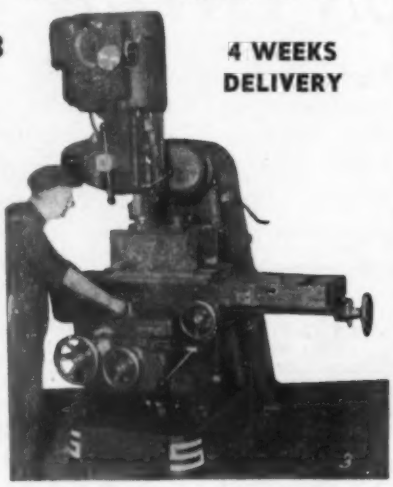
GEAR CUTTING MACHINES
In single and multiple-cut types for cutting teeth on gears up to 1½" pitch diameter.

WALTHAM MACHINE WORKS

WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

INTRICATE MILLING JOBS handled without the need of fixtures . . . on the SHIELDS No. 3 VERTICAL UNIVERSAL MILLER



4 WEEKS DELIVERY

This machine furnishes the answer to many problems involved in today's production where intricacies in parts design call for complicated milling and boring operations which ordinarily would require multiple set-ups and special costly fixtures.

The SHIELDS handles such jobs in a single set-up of the work. Special milling fixtures are eliminated because the head is designed to swivel at various compound angles. Universal milling such as dividing head work is made possible by being able to throw head at proper angle to clear cutter instead of the usual method employed by swinging the table.

An exclusive feature of the SHIELDS is its ability to handle angular boring work — an advantage made possible by a head which incorporates motor and power feeds to spindle in a complete unit.

Table working surface — 64" x 16". Sliding head travel — 7".

Write for complete specifications.

SHIELDS MANUFACTURING CO., INC.
Long Island City, N. Y.

GREENFIELD
NO. 4 TOOL AND CUTTER GRINDER
Ideal for Tool Room or Shop

This machine is furnished either as a Plain Cutter or Reamer Grinder or as a Universal Machine (4U) with attachments for extending its utility.

Modern, sturdy construction is used throughout. Standard is integral with base and extra broad knee is splined to standard. Sleeve of elevating hand wheel is graduated to thousandths of an inch. Head swivels 90° each side of center and is also graduated. Wheel head and spindle are designed for heavy work. Table rests full length on longitudinal slide and is provided with screw adjustment for aligning centers for straight or taper grinding.

Attachments (for Universal Machine) are available for Cylindrical and Internal grinding.

Write for full information

CONDENSED SPECIFICATIONS

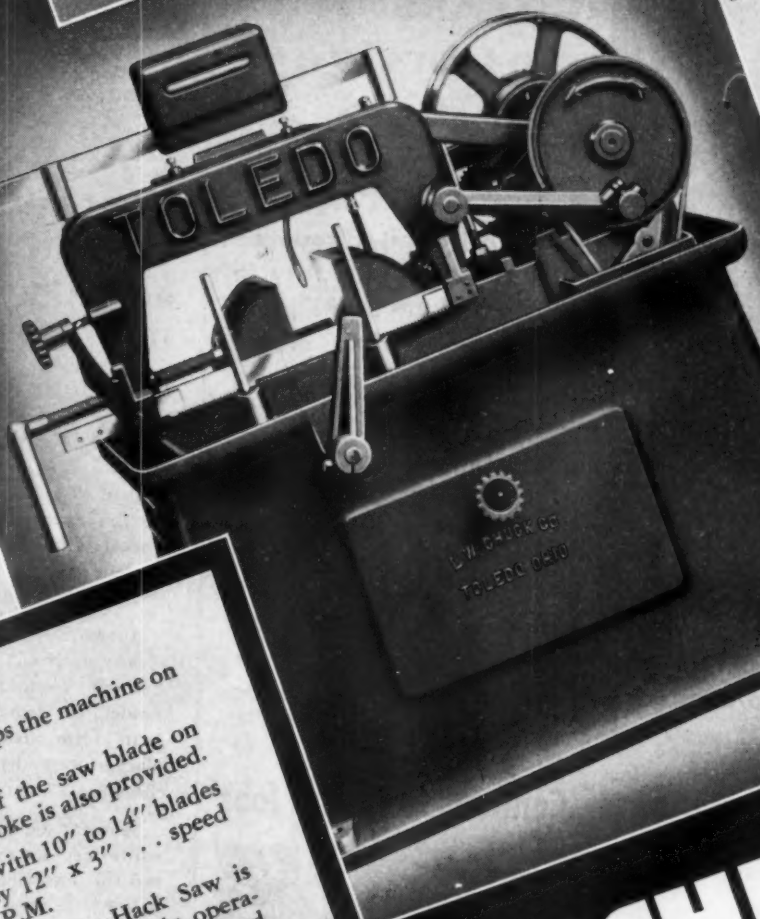
Swing over Table 8½" — Longitudinal Table Travel 18" — Table Surface — 5½" x 28" — Cross Feed — 6" — Vertical Feed — 7" — Will grind cutters on holder — 10" dia. — Capacity Chuck 4" — Will grind cutters on centers — 8½".

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

L-W

HIGH SPEED POWER HACK SAWS
LOW PRICE ··· HIGH QUALITY

The Ideal Saw for any Shop
GRAVITY FEED
LENGTH GAUGE
EXPANDING CLUTCH
DOVETAILED SAW FRAME GUIDE



BUY WAR BONDS

● Automatic trip stops the machine on completion of cut.
Automatic Relief of the saw blade on the non-cutting stroke is also provided.
Capacity 6″ x 6″ with 10″ to 14″ blades ··· Clutch Pulley 12″ x 3″ ··· speed of pulley 120 R.P.M.
This heavy duty Power Hack Saw is highly efficient and accurate in operation. The Saw Frame is so designed that maximum rigidity is obtained. The sliding bearing is dovetailed to fit the arm and is adjustable in all directions. Belt drive, only $180.15.
Furnished, on request, is the 3-speed V-belt Motor Drive Arrangement ··· permits three speeds varying from approximately 90 R.P.M. to 130 R.P.M.; less motor—$25.90.
Motor recommended for use with drive arrangement—½ H.P. standard speed 1725 R.P.M.

Immediate Delivery

L-W CHUCK Company
1-7 N. ST. CLAIR ST., TOLEDO, O.

Also manufacturers of
Demagnetizers
Lathe Chucks
Magnetic Chucks
Milling Machine Vises
Dividing Heads

Today's Wickman PROFILE GRINDER

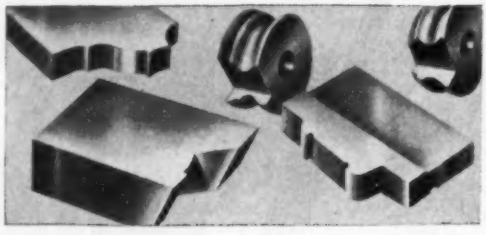
A Machine Backed By YEARS Of Intensive Use In Production

Two years ago, the Wickman Corporation of Detroit introduced to American industry a profile grinder incorporating a fifty to one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine.

Even then, this machine was not a new development. Previously, our associate company, A. C. Wickman, Ltd., of Coventry, England, had many years background not only in the manufacture of the machine but also in its use and application.

After extensive use by a number of this country's best known manufacturers, the Wickman Profile Grinder has proved its exceptional efficiency and accuracy under widely varying production conditions.

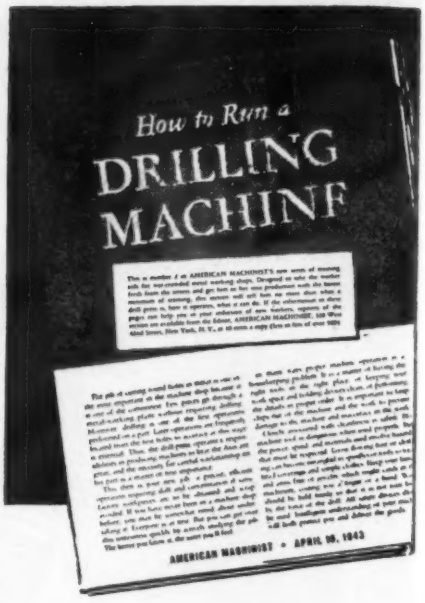
The Answer To Your Difficult Contour Grinding Jobs



Profiles similar to these are being ground in tungsten-carbide and other hard metals on this machine without the use of a radius dresser or formed wheel. If you have any unusual or particularly difficult grinding jobs of similar nature, you should become familiar with the possibilities of the Wickman Profile Grinder for use in your plant. We solicit your inquiries.

WICKMAN PROFILE GRINDER

THE Wickman CORPORATION
15537 WOODROW WILSON
DETROIT, MICHIGAN



To HELP YOU PUT NEW MACHINE OPERATORS on IMPORTANT PRODUCTION JOBS . . . with minimum time for training

● A 16-page, illustrated, practical training course on elementary shop practice as applied to drilling. Designed to help production executives take men or women workers fresh from the streets and make efficient machine operators out of them in shortest possible time.

Appearing originally in *American Machinist* as No. 2 in the series of special training sections on "Tools of Our Trade", the demand for this feature in reprint form clearly indicates the value placed upon the helpful information it contains.

Send for the number of copies you need while they are available. Price 10¢ each; less in lots of over 500. Use coupon below.

MAIL COUPON TODAY!

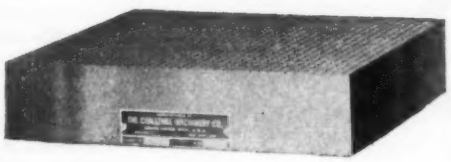
AMERICAN MACHINIST
330 W. 42 St., New York, N. Y.
Please send me ..... copies of "How to Run a Drilling Machine".
Enclosed is $..... (in stamps, check, money order)

Name .....
Title .....
Company .....
Address .....
.....

AMERICAN MACHINIST
330 W. 42 St., New York, N.Y.

SURFACE AND LAPPING PLATES GROUND ON MATTISON SURFACE GRINDER

OVERALL FLATNESS HELD TO LIMITS OF A FEW TENTHS



Mattison Precision Surface Grinder used by Challenge Machinery Co. to finish surface and lapping plates — exacting manufacturing specifications demand excellent finishes, with flatness held overall to limits of a few tenths.

Surface and lapping plates are precision ground on the Mattison High-Powered Precision Surface Grinder at the Challenge Machinery Company. Exacting manufacturing specifications demand excellent finishes, with flatness held overall to limits of a few tenths. Important savings have been effected through the substitution of grinding for previous method, as well as a substantial increase in production.

Rugged, high-powered and versatile Mattison Grinders are built to handle your grinding jobs on a real production basis, providing very close accuracy and a fine finish. They are offered in a wide range of sizes to meet every requirement from 12″ to 36″ wide by 36″ to 192″ long.

SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

A free booklet will be sent upon request, showing how others have reduced time and increased production with the Mattison Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Speed up Your Production!

HANDLE YOUR CUTTING-OFF OPERATIONS (3" and larger) ON THIS NEW MACHINE . . . . .

The Porter-McLeod Cold Metal Sawing Machine will definitely step-up your production and quickly pay for itself when you have to cut stock 3 inches and up.

An outstanding production cutting-off machine, with modern enclosed motor drive and centralized controls, the new 8" Porter-McLeod will handle single pieces or permit nesting of bars or shapes for cutting off multiple units simultaneously.

Feed of blade upward to the stock provides blade protection against riding or bumping. Support of blade near its rim prevents buckling and maintains accuracy of cutting. By pulling blades through the cut, large size stock can be cut with less power and with assurance of a straight cut. Standard feed of the machine is 3 inches per minute and is made by means of a friction disc which insures against blade breakage especially when coming in contact with hard spots in the stock being cut. Feed can be increased for cutting brass and other non-ferrous metals.

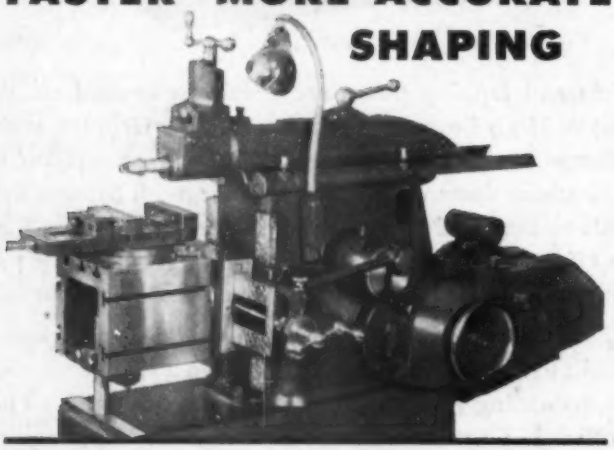
Regardless of the material to be cut, you can depend on this machine for the utmost in productive capacity, economy and speed.

The machine is driven by a 5 H.P. 1800 R.P.M. motor and is equipped with magnetic switch and push-button station. Detailed specifications available on request.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

FASTER-MORE ACCURATE SHAPING



WITH *SHAPE-RITE* SHAPERS

Get these advantages at ½ less cost!
1. ACCURACY
2. SPEED
3. SMOOTHNESS
4. EASE OF USE
5. FLEXIBILITY

Regardless of speed or size of cut, this 8"-stroke shaper has no equal in performance. All working surfaces are precision-ground and hand-scraped to master gauges and all moving parts are fitted to closest tolerances to guarantee accurate work.

Extra-heavy ram and long ram-ways, plus helical-cut and precision-lapped gears help the Shape-Rite to give you the finest possible finish on all types of work—at *low* cost.

Sales Service MACHINE TOOL Company
2426 University Avenue • • • Saint Paul 4, Minnesota

WRITE TODAY for BULLETIN "C"
Gives new features, specifications, prices.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 ¼ in.

Write for illustrated bulletin

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

SMITH & MILLS CRANK SHAPERS

sizes 12" to 32" stroke

THE SMITH & MILLS CO. Cincinnati, Ohio

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin —also circulars on Drill pointers, Point Thinners, Mill cutter Grinders and Tap Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

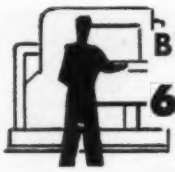
Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

In the Production of
JUST ONE GUN PART

BROACHING
HAS SHOWN THIS SAVING IN MEN AND MACHINES

BY BROACHING
8 MEN - 8 MACHINES



BY FORMER METHOD
61 MEN - 61 MACHINES

In one of our Arsenals 61 men and 61 machines were engaged in machining a certain gun part. Now the same rate of production is maintained on the same part by 8 men and 8 broaching machines. This means that 53 men and machines are available for other work. It means that the cost of these parts is greatly reduced.

If you find it difficult to meet production schedules with your present equipment you undoubtedly can step up your production by broaching. Much of the increase mentioned above, for instance, was made by broaching several surfaces in one stroke.

On a production problem that broaching will solve, talk it over with a Detroit Broach man. There's no obligation, of course.

ARMY (E) NAVY

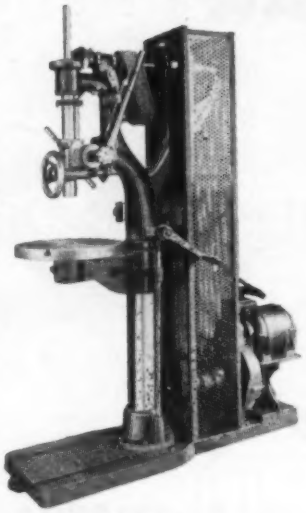
DETROIT BROACH COMPANY
2020 SHERWOOD AVENUE • DETROIT, MICHIGAN

DRILL HOLES UP TO 1½" *with speed and perfect accuracy on this* IMPROVED MOTOR DRIVEN BACK-GEARED MACHINE....

The 21-inch Royersford-Excelsior Upright Power Drill is modern in every detail and combines simplicity and speed with strength and rigidity.

Gears are machine cut, bearings are generous in size. By merely sliding back gears, a quick change can be made from a plain drill to a back-geared machine. Spindle is equipped with ball thrust bearings top and bottom.

Other features include: 8 speeds with 3 distinct and complete feeds—power, hand screw and lever; spindle is counterbalanced and provided with automatic stop and quick return; table is raised and lowered by quick action screw.



SPECIFICATIONS

Distance Table to Spindle—29"
Diameter of Table—18"
Spindle Traverse—9"
Hole in Spindle—No. 3 or No. 4 Morse Taper

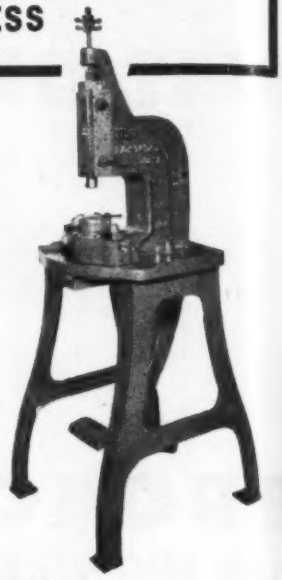
Send for complete detailed information. Immediate deliveries now available.

ROYERSFORD FOUNDRY & MACHINE CO., Inc.
200 MAIN ST., ROYERSFORD, PENNA.

PUT YOUR LIGHT METAL STAMPING ON THIS HEAVY RAPID FOOT PRESS

The **Royersford-Excelsior** No. 10 Foot Press meets all requirements in a machine for handling a wide variety of light work. Every detail has been developed to assure operating convenience and speed.

Features include an adjustable gib for taking care of plunger or machine surface wear; stroke adjustment is also provided; foot lever treadle can be set to suit operator. Die block is clamped to T-slot in base of housing and is machined to receive die holder or vise furnished with machine. Punchings fall into conveniently placed table drawer.



SPECIFICATIONS

Height—floor to table—2' 7".
Table Size—23¼" x 15".
Depth of Throat—3".
Stroke (Max.)—2".
Capacity—½" through 1/16" soft steel

Immediate deliveries available. 12 different sizes available.

ROYERSFORD FOUNDRY & MACHINE CO., Inc.
200 MAIN ST., ROYERSFORD, PENNA.

REED-PRENTICE

LATHES
JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS

REED-PRENTICE CORP.
WORCESTER MASS. U.S.A.

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.
WORCESTER, MASS.

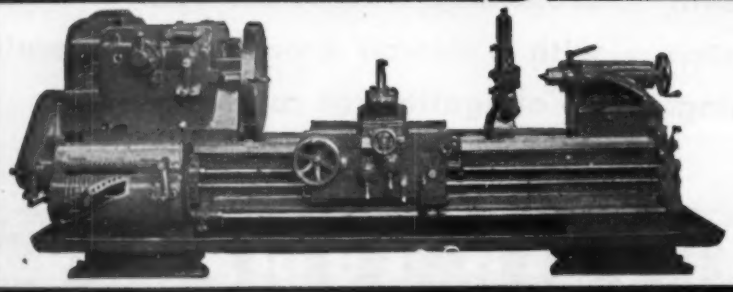
LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

SPRINGFIELD GEARED HEAD LATHES

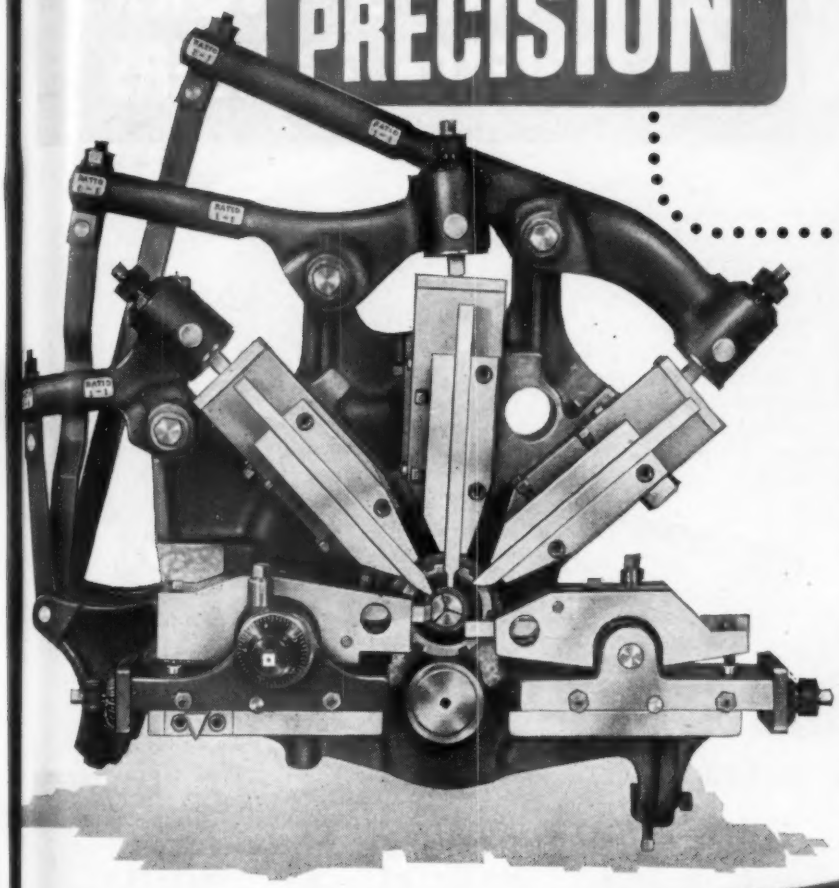


for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

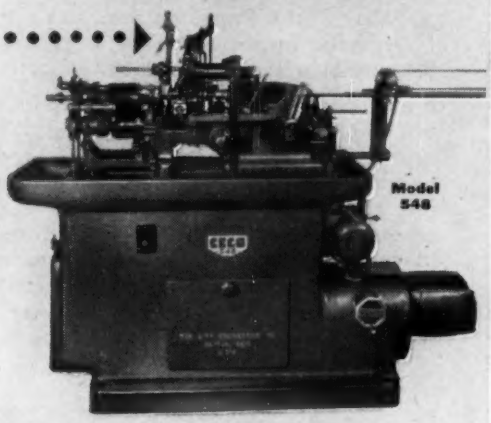
One-Operation PRECISION



CECO

SWISS TYPE *Automatic*

UNIVERSAL PRECISION SCREW MACHINES



Highlight Features!

BAR CAPACITY: ⅜" and ½"

4 or 5 RADIAL TOOL SLIDES.

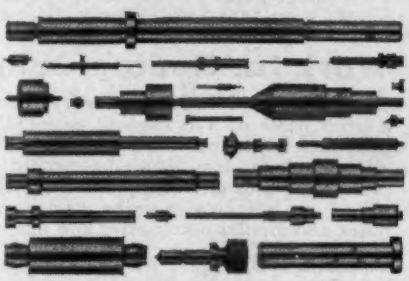
MAXIMUM TURNING LENGTH: 4" with flat cam.

MASTER SPEED RANGER: Varies Spindle speed from 675 to 7500 R.P.M. at the turn of a handwheel.

PRECISION ROLLER BEARING SPINDLE: Always in adjustment.

CONSTANT RISE FEEDING MECHANISM gives extreme feeding accuracy.

Serving some of America's greatest precision-makers, including Norden, Kollsman, Sperry, Bendix and many others, the Ceco Automatic is revolutionizing the mass production of small intricate parts—cutting tool costs, speeding the set-up and producing *one-operation precision work* with amazing economy and efficiency.



THIS BOMBSIGHT PINION SHAFT
IS AN EXAMPLE OF CECO'S
ONE-OPERATION, HIGH-SPEED PRECISION PRODUCTION

Produced by Ceco *in one operation* instead of three formerly required, and with single tip tooling, thereby eliminating form tools commonly used, is the Bombsight part reproduced above.

Shown on this page are a few of the hundreds of parts Ceco produced in *one operation* with extreme accuracy and high finish. Odd shapes and multiple diameters, also complicated forms, including tapers, bevels, radii, etc., are Ceco-produced with single tip tools. Result—quick set-up, low cost, and faster high precision production of intricate parts. For information and literature write:

THE CITY ENGINEERING CO.
DAYTON, OHIO

Since 1909, Designers and Builders of Tools, Dies, Jigs, Fixtures, Gages and Special Machinery.

HANDLING A WIDE RANGE OF WORK WITH HILL HYDRAULIC SURFACE GRINDERS

★ Most HILL Precision Surface Grinders are purchased for a specific application, but all users of HILL Grinders find they are also ideally suited for a multitude of other operations.

It is this versatility that has resulted in HILL *"Open Side"* Hydraulic Grinders superseding other methods of finishing. The HILL grinder features massive construction, wide speed variation, 100% hydraulic drive, simplified controls, ample motor power for rapidly removing stock, and accuracy maintained within requirements. HILL Hydraulic Surface Grinders should have a definite place in the post-war planning of your revamped shop efficiency. HILL Grinders are built in both Horizontal spindle and Vertical spindle types in a wide range of sizes. Bulletin H-V-8 gives full details.

18" x 18" x 120" HILL *"Open Side"* Horizontal Spindle Hydraulic Surface Grinder, with magnetic chuck holding work in place.

The HILL ACME Co.

6400 BREAKWATER AVE. • CLEVELAND, OHIO

Hydraulic Propeller Barrels Receive Final Finishing Within .0005" to .0002" Tolerances by BARNESDRIL HONERS

Best performance is obtained from these hydraulic propeller barrels by precision final finishing with BARNESDRIL Honers. The honing operation is accomplished by simultaneous rotation and reciprocation of the hone under pressure in the bore. The honed bore is 3.125" I.D. x 9" length with .003" stock removal for the rough and finish operations.

BARNESDRIL *Honing Machine in airplane production plant making aircraft hydraulic propeller barrels.*

Work for Honing Operations

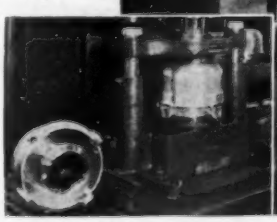
The BARNESDRIL Self-Oiling, Hydraulic Honer is also adapted for other aircraft parts such as landing gear cylinders, aircraft engine cylinders, propeller hubs, and shaft extensions. In addition it is used for honing all engine cylinders, hydraulic machinery, ordnance parts, pumps, compressors, steam engines, pneumatic equipment, connecting rod bores, piston pin holes, cylinder liners, tractor motor sleeves, bushings, gear holes and similar automotive and machine work.

BARNESDRIL HONERS ARE AVAILABLE to fit individual requirements; Vertical, Horizontal, Angular, Internal and External Types, with one or more spindles *for honing any size bore.*

Part has 3.125" I.D. x 9" length bore, stock removal .003" in rough and finish honing.

BARNESDRIL ENGINEER SERVICE available for your help—submit blueprints for our analysis and recommendations at no obligation.

FREE HONING DATA with complete details of the honing process and the BARNESDRIL line of equipment. Write today for Bulletin No. A.



Barnes Drill Co.

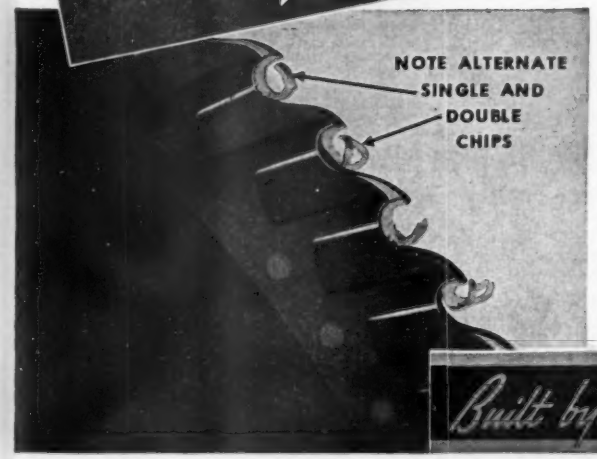
830 CHESTNUT STREET

ROCKFORD ILLINOIS, U. S. A.

THE MOTCH & MERRYWEATHER Triple-Chip METHOD

IS IDEAL FOR COLD-SAWING NON-FERROUS METALS—

Aluminum
Admiralty Brass
Alloy Brass Copper
Cupronickel



Watch the Motch & Merryweather Cold Sawing Machine race through non-ferrous metal and you will be convinced that the equipment was designed from the floor up for this specific purpose. *No after-thoughts have been "tacked on."* Note the high surface speeds of the saw blade and the rapid hydraulic feed which readily keeps pace. Study the balanced drive and solid construction which easily sustain the operation, requiring a minimum of horsepower. Observe how the Motch & Merryweather Segmental Type Saw Blade cuts fast, clean, and square, without chatter or burr . . . Only Motch & Merryweather builds *all 3:* the blade, the machine that uses it, and the saw sharpener that grinds it. Get Bulletin.

Have you a problem involving any of the metals named at the left? A full description will bring you a satisfying answer.

THE MOTCH & MERRYWEATHER MACHINERY COMPANY

Penton Building • Cleveland, Ohio

Built by MOTCH & MERRYWEATHER

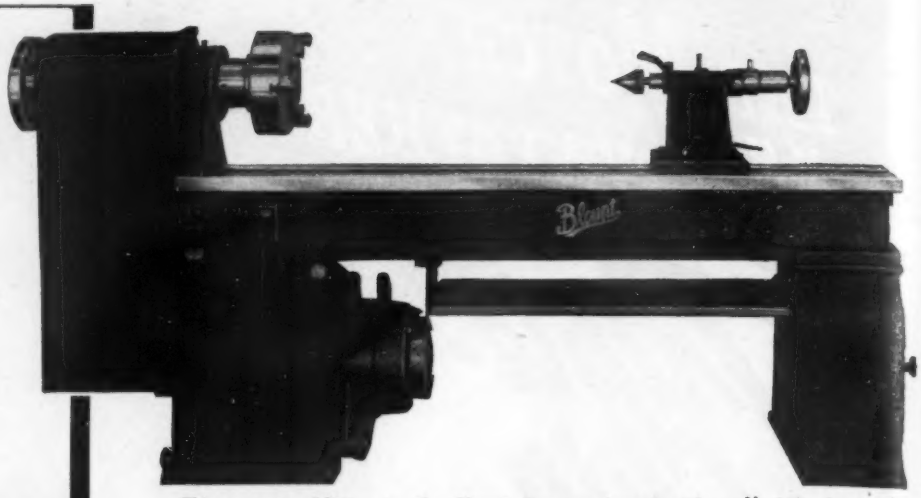
THE MOTCH AND MERRYWEATHER MACHINERY CO. CLEVELAND CINCINNATI DETROIT PITTSBURGH

"Blount"

MODEL B-3

Special Application

LATHE



. . . a **NEW DESIGN** *for turning, chucking, polishing and lapping*

Ask for Bulletin D-18 giving detailed information on this machine.

This recent addition to the Blount line, equipped with a ¾ HP, 4 speed ball bearing headstock motor-in-leg, provides speeds of 515, 850, 1125 and 1725 R.P.M. It has a 20" swing and 8' bed and can be furnished also for a 24" swing. Spindle speeds of 41 RPM to 421 RPM are available with a reduction geared motor belted to head. Other speeds, from 300 to 900 and 300 to 1800 R.P.M. are optional.

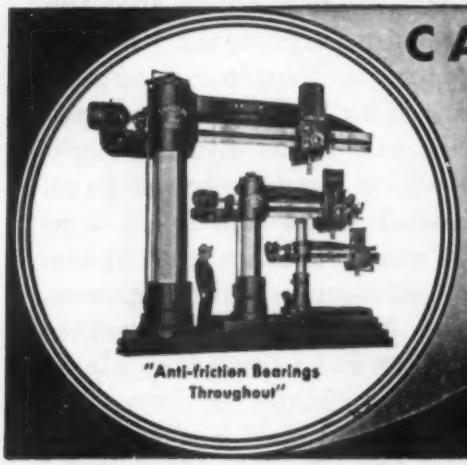
Convenient control is provided by controller with reversing switch mounted on outside of headstock leg.

Other details of the Model B-3 include:

Spindle nose 3½" dia. 6v. threads per inch, maximum hole in spindle up to 2½" if desired. Bed 10¾" x 9½" deep with 3" wide shot. Tailstock base 10½" x 10½" with 1¾" dia. spindle with 6" travel and No. 3 Morse taper for center. Lathe Chuck 12" with safety locking screws. Rear hand wheel 11" dia. Standard equipment includes belt and belt guard.

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

CARLTON RADIAL DRILL



"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

CINCINNATI LATHES

Precision—on High Speed, Heavy Duty Machining

Load up Cincinnati Lathes to their full capacity—take heaviest cuts at highest speeds . . . their rugged construction guarantees constant precision! Produced in 14" to 30" sizes, with 12 or 24 speeds and 32 to 96 feeds, they are designed throughout to handle the toughest jobs. Write for latest complete catalog.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

A NEW TOOL FOR CENTERING ROUND BARS

THE

WHITCOMB QUICKCENTER

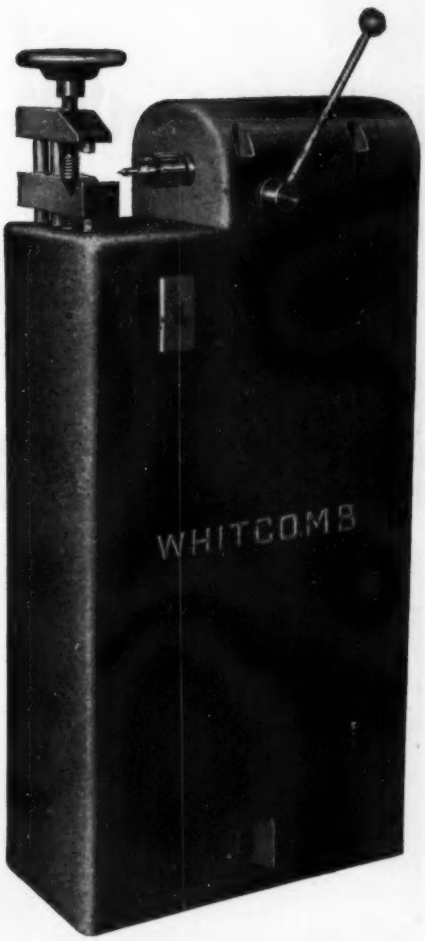
IT'S FAST – IT'S EASY – IT'S ACCURATE

Increases shop output
Uses unskilled operators
Saves time and material
Increases shop profits

The Quickcenter is a new shop tool that provides a fast, easy, accurate method of centering round bars for machine work.

It is operated by placing one end of the bar on the vee-block and tightening the handwheel which, by means of right- and left-hand threads of unequal pitch, raises the block and lowers a button until the work is clamped tight. When tight, the center of the bar is in line with the center of the spindle. The lever then advances the center drill into the work.

Because operation involves only the use of a handwheel and lever, the most inexperienced operator can now center work quickly, easily and accurately.



FEATURES

The vee-block is hardened and accurately ground and is fitted with a fine phosphor bronze nut to assure long and accurate life. The button is hardened for wear resistance. The hardened and ground spindle is fitted with grease-sealed, preloaded ball bearings. The spindle is equipped with a Jacobs chuck of ½" capacity and speeds of 700, 1300, and 2300 rpm are available from a three-step vee-belt sheave driven by a ¼ hp 110-volt motor. The Quickcenter is adjusted to center within .005" and it will do in a minute what can take over half an hour on a lathe.

SPECIFICATIONS

Height—49" Length—23" Width—13"
Will center round bars from ½" to 3" diameter
Drill chuck—½" capacity
Speeds—700, 1300, 2300 rpm
Motor—110 v, ¼ hp, 1 ph
Shipping wt. approx. 400 lbs.

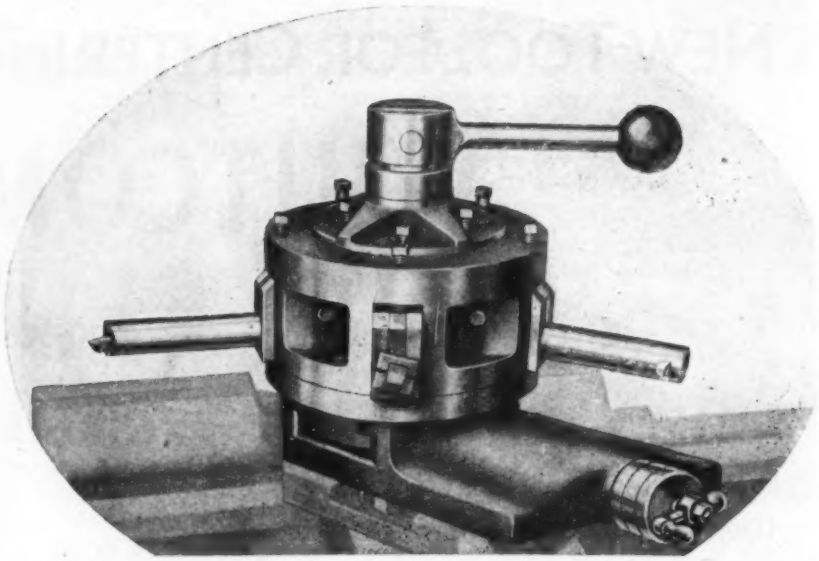
PRICE $250 F.O.B. FACTORY

(Price and specifications subject to change without notice.)

WHITCOMB MANUFACTURING COMPANY

TROY, N. Y.

Give your engine lathes the versatility *and* productiveness of turret lathes . . . with



Improved 5-STATION TURRET HEADS

These modern 5-station Heads, with oscillating tool blocks, are available in four sizes, making it possible to quickly convert present engine lathes from 6" to 30" swing into fast, accurate and highly productive turret lathes. These attachments are easily installed and require no extras such as special tool adapters.

Extremely simple operation enables even inexperienced operators to handle work set-ups involving multiple tooling. An eighth turn of the handle and a lift of 45° releases turret head for turning to any one of ten indexed positions where the head is securely stationed. Tool bits may be rotated as well as tilted in any position for accurate, efficient cutting.

These Improved Turret Heads are sturdily built with tools adequately supported for heavy cuts and can be depended on for long, hard, precision service. They become an integral part of the machines to which they are applied.

Write today for Descriptive Bulletin, giving full details of these time, money and labor saving attachments.

AUTOMATIC MACHINE & TOOL CO., Auburndale, Mass.

CRITERION
Boring Heads
Speed
PRODUCTION

These Criterion heads save time! Smooth, compact, rigid! Large, easy-to-read, graduated dial. Lead screw is hardened tool steel. ITS THREADS ARE GROUND FROM THE SOLID AFTER HARDENING, assuring constant accuracy. Parts subject to wear are hardened. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3" ½" and 1" bar capacity Ask your dealer, or order direct. Request free literature

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA
NEW YORK OFFICE 205 E. 42ND ST., N. Y.

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

CRAFTS

CARBIDE TIPPED
Consistent Quality
GAGES AND TOOLS

ARTHUR A. CRAFTS COMPANY, INC.
603 Newbury Street at Kenmore Sq. BOSTON
DETROIT · CHICAGO

SHAPING THE TOOLS OF WAR!

In war production plants the Diehl Turret Lathe is taking an active part in shaping the tools of war . . . tanks, guns, planes and ships. Working side by side of other standard No. 2 lathes in the production line . . . using the same tooling, including collets, making it an ideal lathe for adding to your present equipment as special tooling is not necessary. The Diehl Lathe, embodying the most advanced developments, is unsurpassed for long hours of high speed precision production. Write for complete specifications and illustrated brochure.

Automatic chuck capacity (round)..... 1"
Swing-over cross slide..... 6"
Swing-over bed ..... 14"
Six speeds.....forward and reverse.

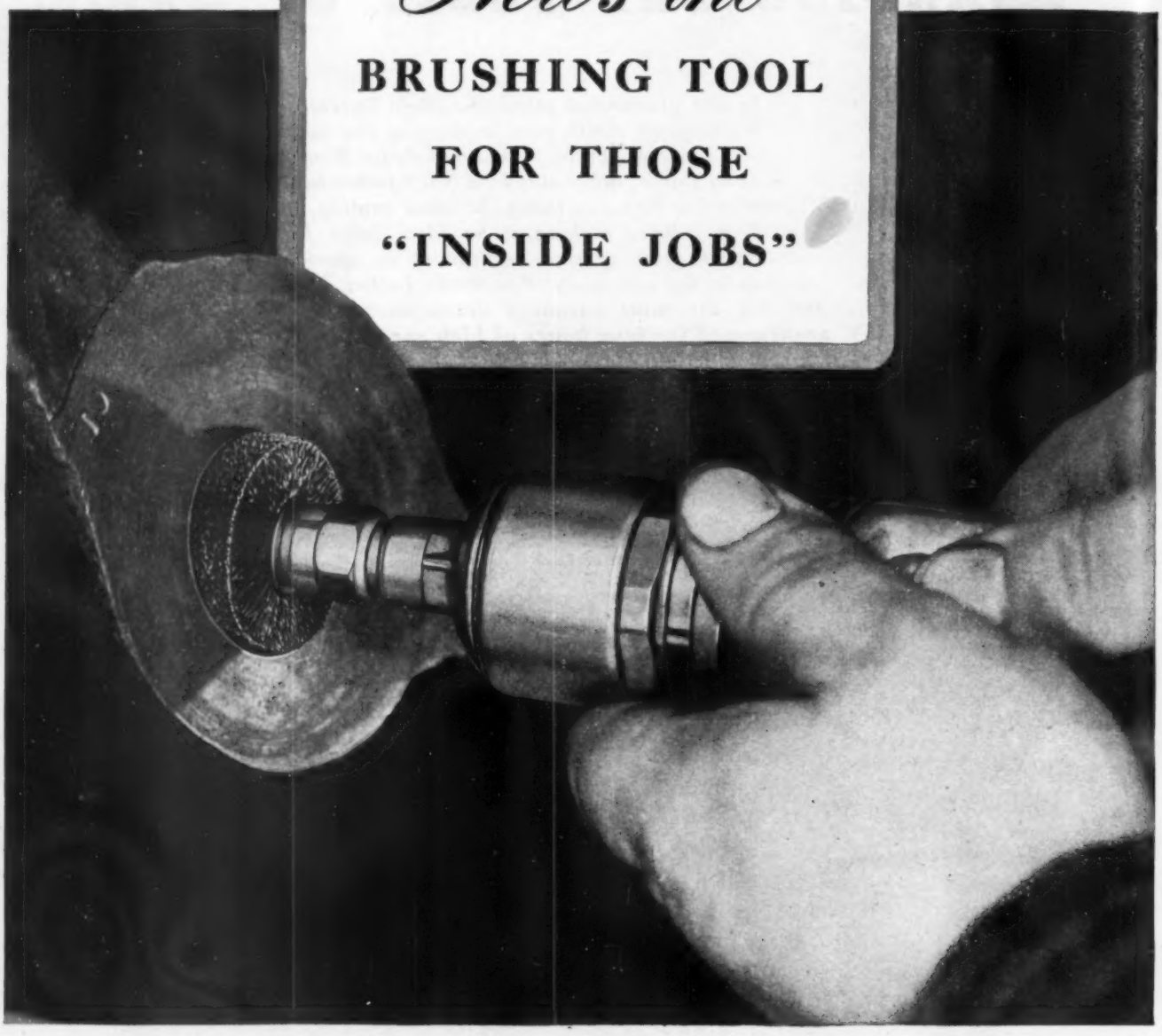
The G. M. **DIEHL** *Machine Works.*

WABASH - INDIANA

Where Precision Craftsmanship is Honored

Here's the

BRUSHING TOOL FOR THOSE "INSIDE JOBS"



HUNDREDS of manufacturers, faced with the problem of cleaning scale, burrs, rust and corrosion from interior surfaces of vital war material, have found the answer in fast, hard-working Osborn Ringlock Section brushing wheels.

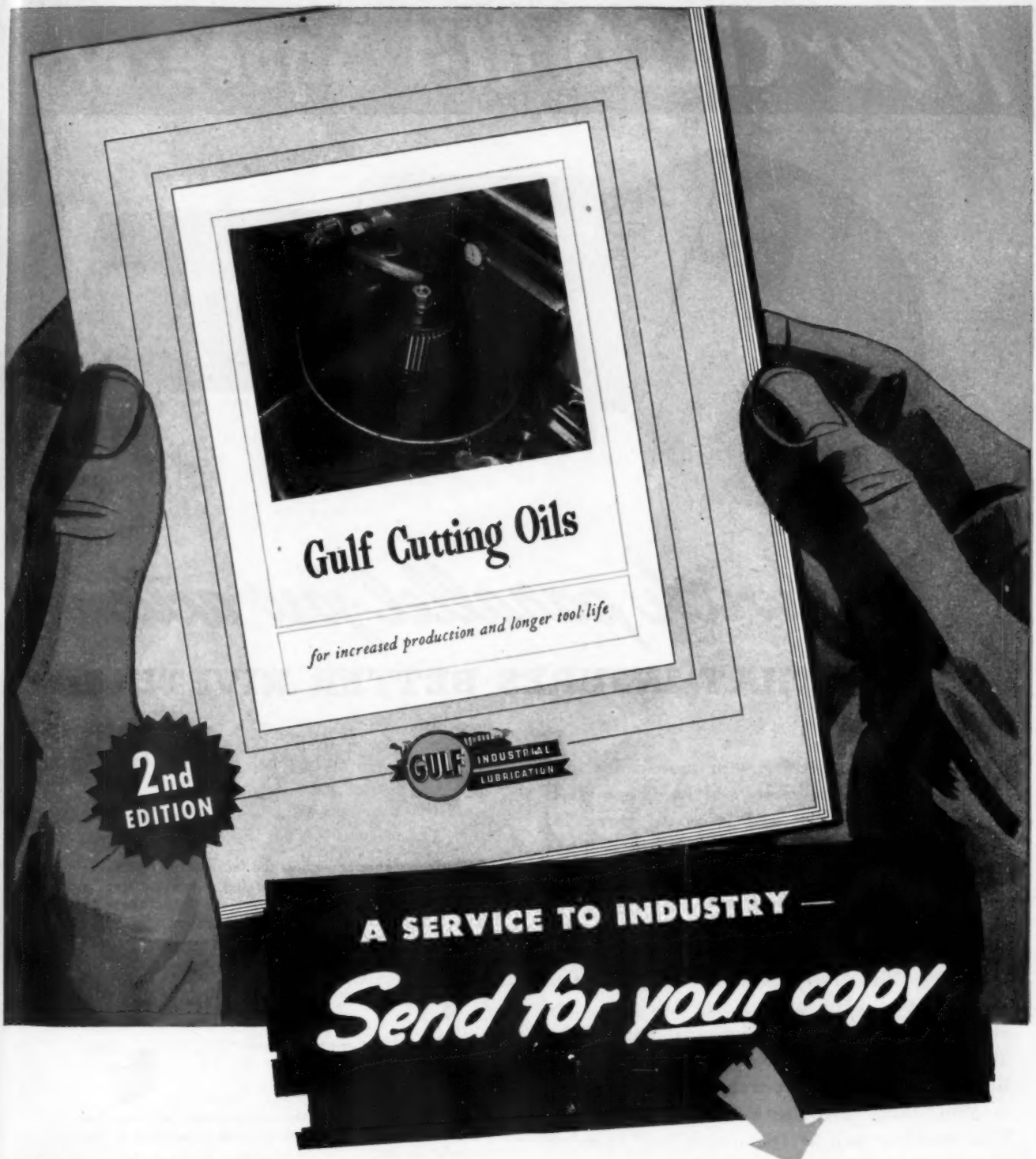
Pipe, tubing, recesses in machined and fabricated parts—in fact all the tough, hard-to-get-at, internal areas—are just what this versatile brushing tool was made for. Its single retaining ring and locked-in construction permit high speed operation with either air or electrically-driven power tools and it can be mounted singly or in multiple setups.

For internal burring, cleaning, scaling and polishing, the Ringlock Section answers a universal need. It is made in diameters from 1″ to 3″ and of wire ranging from .0025 to .014, and can be had in tampico, horse-hair and synthetic bristle.

This fast-cutting little brushing wheel is just one of the many tools with which the Osborn Brushing Specialist in your district can help you speed your output and reduce costs of products for both war and peace. For help on specific war production problems get in touch with him today through *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland, Ohio.*

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

Osborn Brushes


Gulf Cutting Oils
for increased production and longer tool life
2nd EDITION
GULF INDUSTRIAL LUBRICATION
A SERVICE TO INDUSTRY —
Send for your copy

THIS new booklet, just off the press, is another contribution to Gulf Industrial Lubrication Engineering Service.

It tells of Gulf's new revolutionary cutting oils, scientifically developed to meet today's exacting machining problems.

In addition it contains valuable data on machine shop practice, including cutting speeds, tool settings, tables, etc. To get *your* copy of this useful booklet, just fill in and mail the coupon.

Gulf Industrial Lubrication Service Engineers can help you with your machining problems.

GULF OIL CORPORATION · GULF REFINING COMPANY

Gulf Oil Corporation · Gulf Refining Company **A.M.**
3800 Gulf Building, Pittsburgh, Pa.

Please send me a copy of the new revised booklet, "Gulf Cutting Oils," which includes a 40-page Machining Guide.

Name .....

Company .....

Title .....

Address .....

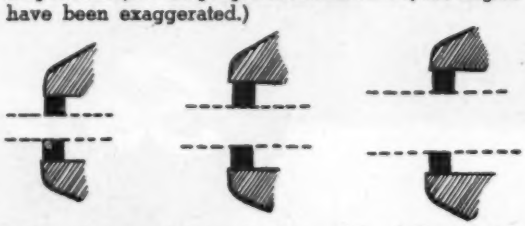
New CLECO 41-L Squeezer

with parallel jaw action

THAT INSURES BETTER RIVETING

★ The faces of the riveter arm dolly and the anvil arm dolly of the Cleco 41-L Alligator Squeezer are *always parallel regardless of the amount of gap.* This exclusive feature prevents disalignment ("clinched rivets") and loss of rivets; it insures tight rivets with uniform heads, and does not cause distortion in the surrounding metal. ★ The 41-L is new in design, but is built to the same uncompromising quality standards that have distinguished Cleco Tools for so many years. This squeezer is light and powerful; it weighs only 5½ lbs., is 12¼" long, and has a ⅛" rivet capacity. The working gap is $^{15}/_{16}$", with full opening of 1½". It is equipped with automatic return throttle, and adjustable pressure "pop-off," as well as return limit stop on alligator jaw. ★ To meet your wartime production schedule you can't afford to be without this unique squeezer. *Write now for complete information.*

● These sketches show how the faces of the dollies on an ordinary squeezer are parallel when the gap is small. But as the gap increases, the faces cease to be parallel. (For the purposes of illustration, the angles have been exaggerated.)



● In contrast, note how the faces of the dollies on the 41-L Squeezer are *always* parallel regardless of the amount of gap.

The New Repairable Cleco Sheetholders with Latest Design Pliers.

THE CLEVELAND PNEUMATIC TOOL CO.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

MARBLE AVE., AT EAST 77th ST. CLEVELAND, OHIO

LATROBE Double-Six

"You will recall the dovetail cutter job in which the tools lasted anywhere from five minutes to one-half hour, and the tools were not cracking but literally exploding. Well, we recently switched to Double-Six with great success. The first tool we tried made of Double-Six was used to machine several hundred pieces, and was in operation about one hundred hours. This was done on N.E. 8620 steel of a hardness of approximately 190 BHN.

The remarkable thing to the foreman of the milling machine department and the boys in the tool crib was that the tool was returned to the crib at the finish of the job and did not require grinding.

In fact, from what I have been told, the tool was cutting better at the finish than it was at the start."

definitely increases tool life... decreases set-up costs...

Ask for a copy of LESCO REFERENCE TABLES, containing page after page of useful technical data and tables. FREE

THE above excerpt is from a letter recently received from an enthusiastic user of Latrobe DOUBLE-SIX. Such performance is typical of Double-Six. Not only will it be found to effect substantial savings in production time, but it will prove superior in many difficult cutting operations. Double-Six can be readily heat-treated to attain maximum efficiency.

Ask for special bulletin on Double-Six.

TOOL STEELS FOR VICTORY

LESCO

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES and PLANT · · LATROBE · PENNSYLVANIA

SAVES $675
AND VALUABLE OIL

One Manufacturer*

saves $675 a month in cutting oil costs with a 26" American Chip Wringer... More than 90% of the costly cutting oil is reclaimed from every load of metal chips and machine turnings, in less than **3 minutes** operating time. And any unskilled person can operate an American Chip Wringer.

It is not only good business to save money with an American Chip Wringer, but you also conserve precious oil. Find out how much money and oil an American Chip Wringer will save **you.** Don't delay! Write for full details today.

American Chip Wringers are available in the following sizes:
20" 30"
26" 40"
48"

*Name furnished on request.

ARMY E NAVY

The AMERICAN LAUNDRY MACHINERY COMPANY
CINCINNATI, OHIO

SYNCRO
THE NAME
Every Production Man Should Know

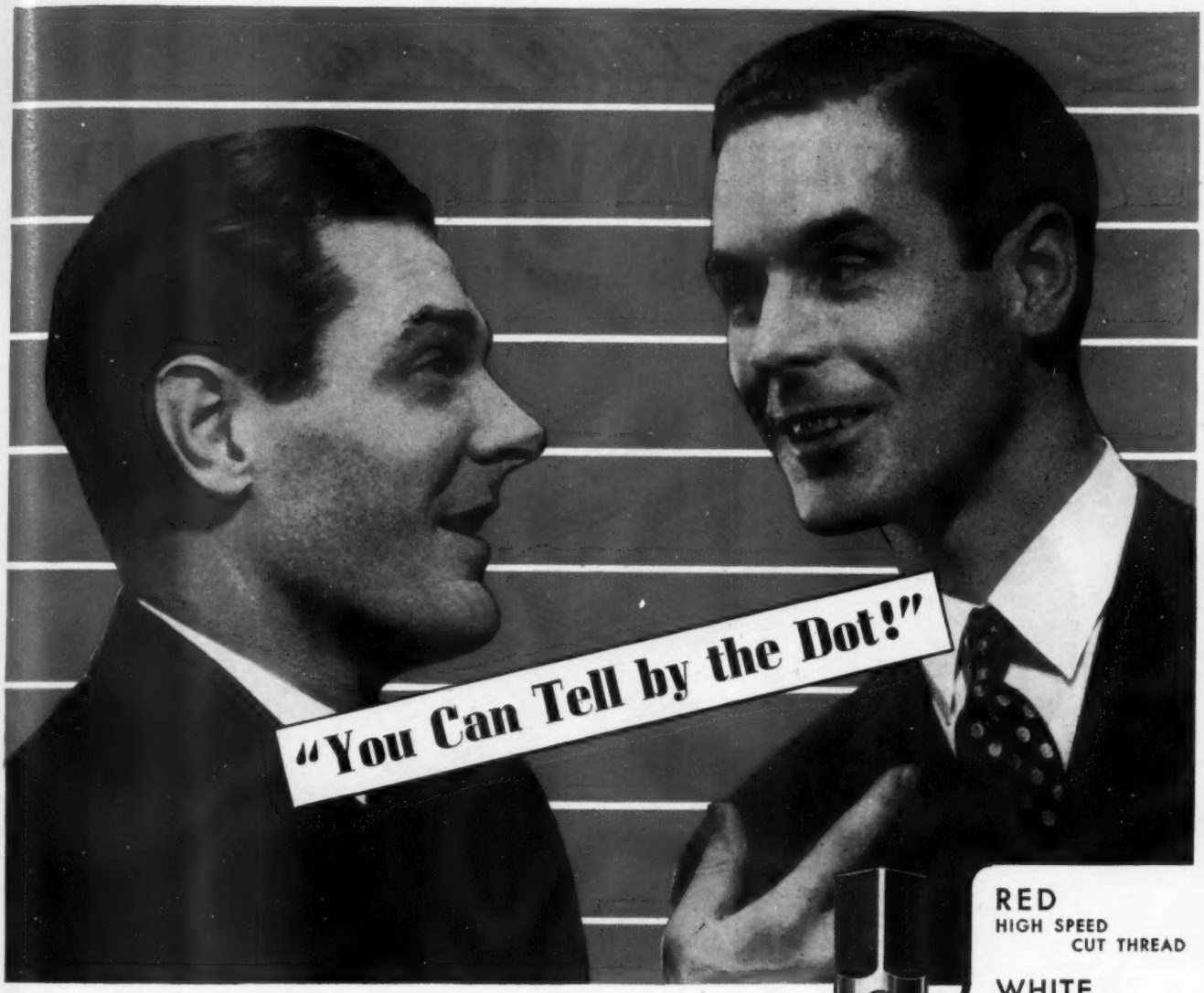
If you have special engineering and production problems — let SYNCRO help. SYNCRO engineers have been solving unusual problems every week for factories everywhere. Make use of SYNCRO'S complete manufacturing facilities for the development of precision machine tool parts — special tools — fixtures — production parts — now and after Victory.

The experience and skill of SYNCRO engineers and craftsmen is at your service — now and after Victory.

•

SYNCRO DEVICES, INC.
3265 Bermuda Avenue
Dept. AM-93 — Ferndale 20, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOL PRODUCTS



RED
HIGH SPEED
CUT THREAD

WHITE
COMMERCIAL GROUND

BLUE
PRECISION GROUND

PASSING THE WORD AROUND!

"Threadwell Taps? Sure, they're the ones with the dot. They have stepped up our production and lowered our threading costs."

Thus the word goes around.

Every high speed Threadwell Tap has a dot on the shank—red for cut thread, white for commercial ground, blue for precision ground. In the tool room or on the job, you can tell at a glance by the color of the dot.

And on the job, you can also tell a Threadwell Tap by its superb performance, its accuracy, its stamina. See your Threadwell distributor. He will give "personal attention" to your threading problems.

EXPORT STOCKING DISTRIBUTORS
CANADA: Bridge Machinery Co., Montreal
ENGLAND: Skylux Ltd., London

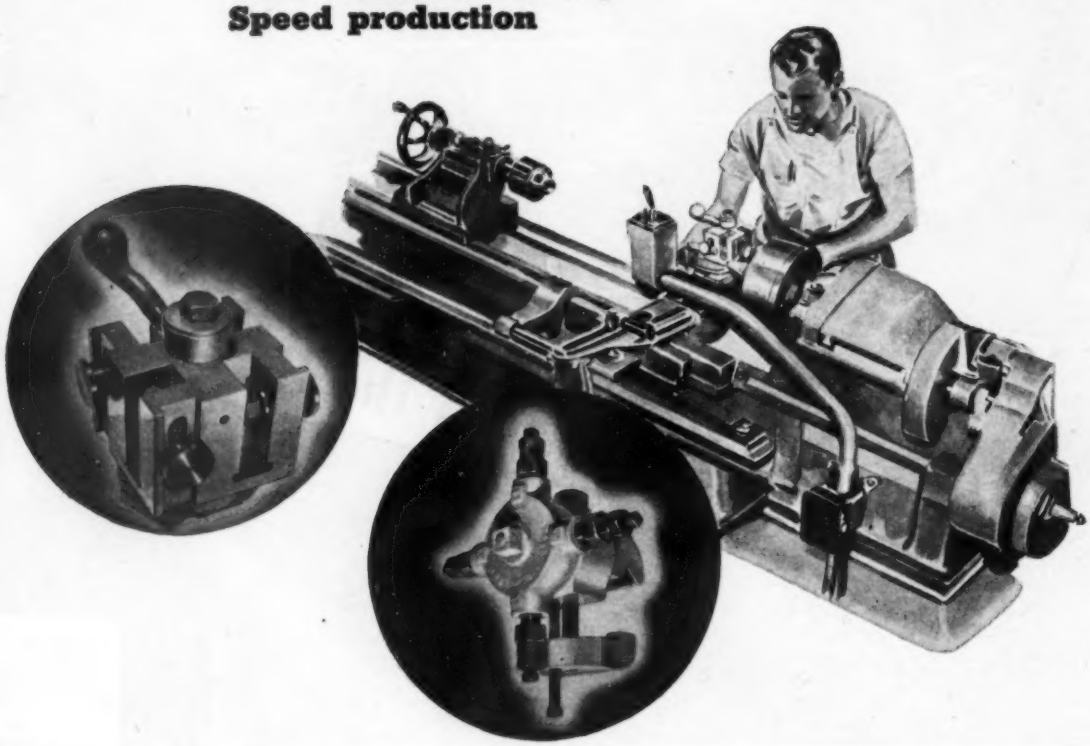
Threadwell
"TAPS OF DISTINCTION"

THREADWELL TAP & DIE CO., GREENFIELD, MASS., U. S. A., FOUNDED 1902

Your Lathe can do

4 OPERATIONS WITH 1 SET-UP

Save time and money
Speed production



➡The new SPECIALTIES production team can multiply the productive capacity of your machine many times. The Cross-Slide Turret enables four side working operations without tool changes. The Lathe Stop eliminates repeated measuring and speeds up production. Mail the coupon for detailed information on this flexible Specialties production team.

➡ With SPECIALTIES CROSS-SLIDE TURRET you can do four machining operations on the same lathe, tying up only one lathe instead of four. Simply flip turret from one index position to another. Use cross-slide turret on several different sized lathes and minimize equipment costs.

➡ With SPECIALTIES LATHE STOP you measure only once for each operation. Simply set the lathe stop, which is automatically locked by a spring pin index, and save valuable time in performing multiple lathe operations.

SPECIALTIES Manufacturing Co., Inc.
43 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

Name_____

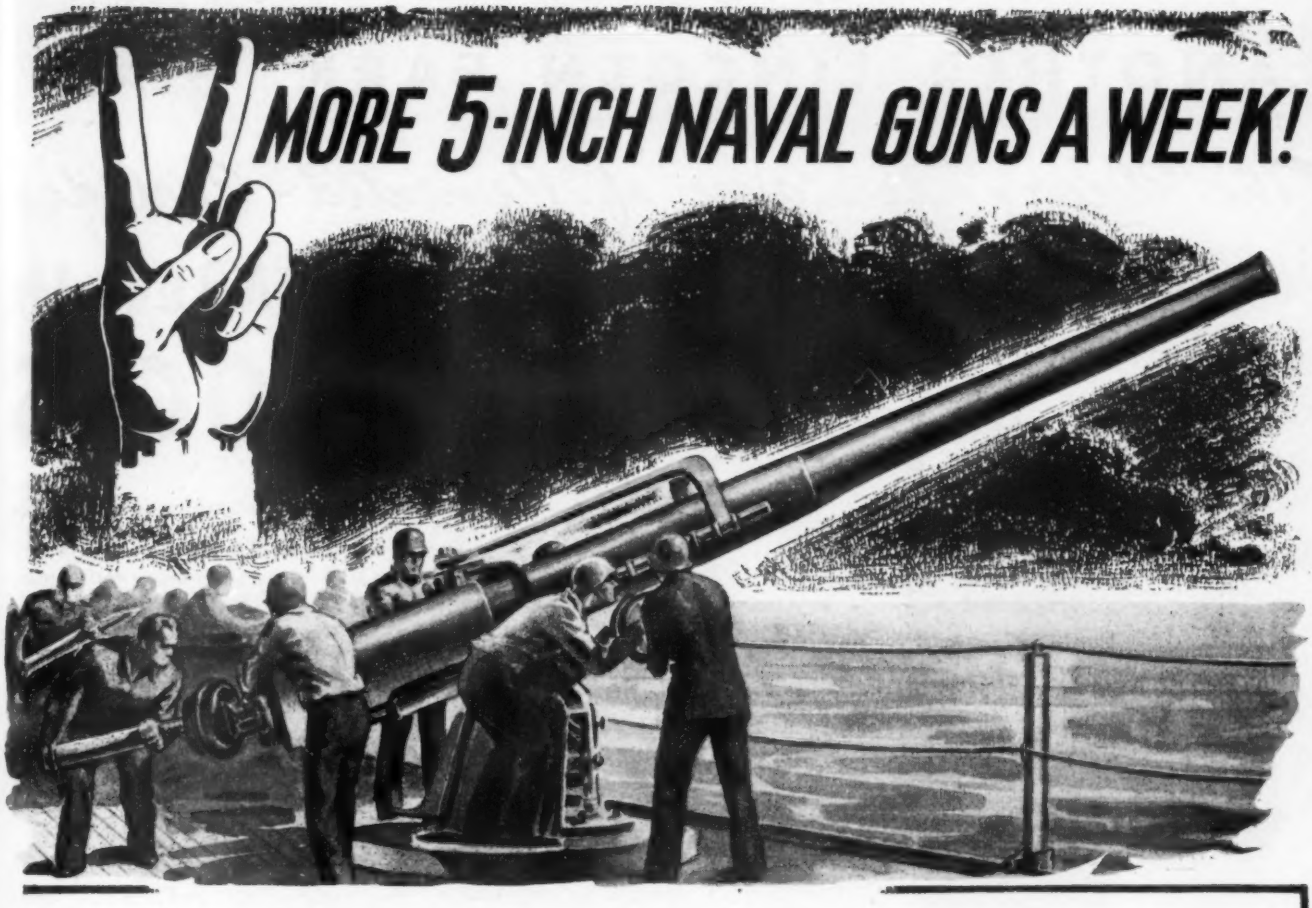
Company_____

Address_____

City_____ State_____

SPECIALTIES
MANUFACTURING COMPANY, Inc.

MORE 5-INCH NAVAL GUNS A WEEK!



SIMPLY by replacing with Oakite Grinding Compound the coolant being used in their finish grinding operations on 5-inch naval guns, one plant has been able to increase output . . . turn out *TWO MORE GUNS* a week. But that's not all! In addition, this plant gains *SIX* other important advantages:

1. *CLEANER work*
2. *90% LESS chatter*
3. *GREATER precision*
4. *SMOOTHER finish*
5. *NO rancidity*
6. *LONGER wheel life*

Instead of changing the coolant every three weeks as formerly required, it is now done every one and a half weeks. On the basis of actual time studies, this means *SIX HOURS MORE RUNNING TIME PER WEEK FOR EVERY MACHINE* . . . another one of many typical examples where production is being stepped-up and kept running smoothly in war plants the Nation over using specialized Oakite materials.

Nation-Wide Technical Service *FREE* to Help Solve *YOUR* Problems!

Whatever your war production problem . . . whether it be degreasing, cleaning, descaling, machining, grinding, drawing, stamping, burnishing or tumbling . . . our nearby Technical Service Representative stands ready to give you the benefit of his specialized knowledge and successful experience to help you find the right answer. Write today . . . no obligation, of course.

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK 6, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS...METHODS...SERVICE

CLEANING FOR EVERY CLEANING REQUIREMENT

ANOTHER LINCOLN PARK *"First"*

The Wear-Resistance of Cemented-Carbides

NOW AVAILABLE IN GAGE BLOCKS

Carblox—Lincoln Park's new cemented-carbide gage blocks—provide the means to greatly reduce the wear error in gage block use. Sets of gage blocks made of other materials, and which are used continuously as master or working sets for comparative measurements, wear rapidly and will show a loss in size of a few millionths to as much as several ten thousandths of an inch within a short time. Carblox will retain their accurate size within the allowable wear tolerance at least fifty times longer than steel blocks used for the same purpose.

The greatest wear factor in the use of any gage blocks is caused by abrasion on the ends of the build-up. A relatively small amount of wear is caused by the wringing together of the blocks. Carblox used on each end of a build-up will act as protective anvils and prevent wear on the less wear-resistant steel blocks.

Carblox are practically non-magnetic and are highly resistant to rust or corrosion. Their high cohesive factor facilitates the wringing of thin blocks and eliminates the difficulties now encountered in wringing thin steel blocks.

Carblox, with their high wear resistance, will maintain their original accuracy for a long period of time . . . will largely eliminate the customary necessity of checking blocks . . . will greatly increase the usable accurate life of all gage block sets . . . will reduce to a minimum scrap or rejections that might result from the use of worn gage blocks.

CARBLOX
ARE SUPPLIED IN THE FOLLOWING BUILD-UP RANGES

Carblox are furnished to "A" accuracy (.000004") and "B" accuracy (.000008") as a series of wear blocks to be used on the ends of a gage block build-up or as individual blocks when a build-up is not required.

The fourteen block set consists of two .050", two .100" and one each of .05005", .0501", .0502", .0503", .0504", .0505", .0506", .0507", .0508", and .0509". The .050" and .100" blocks are also furnished in boxes in pairs as well as in combination—that is two .050" blocks and two .100" blocks in a box.

The full build-up range of the standard 81-piece set of gage blocks is available when Carblox are used. For example in a .4051" build-up, one .050" Carblox and one .0501" Carblox would be used with one ordinary .200" and one ordinary .105" gage block. The half-tenth (.05005") Carblox further supplements regular gage block sets.

WRITE FOR COMPLETE DETAILS

CARBLOX

ARMY E NAVY

LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

TODAY, as the forces of The United Nations are rapidly advancing their march into foreign shores, virtually the entire industrial output of America is concentrated upon this stupendous task.

More than any war in history, this has proved to be a war of tools. When we beat our military timetables today, we do so because the tool production exceeded schedules months ago.

We at "*Greenfield*" pay hearty tribute to the millions of average Americans who have helped to supply the varied equipment our armed forces need. When the "invasion" is ended, we can promise them that the new skills we are learning now will compensate for "doing without" by providing finer products for the peace-time world we all await.

- BACK THE ATTACK WITH WAR BONDS -

What's the quickest *action* you can take to shorten the war for that son, that friend, those former employees of yours who are doing the fighting? The answer is easy. Buy at least one *extra* Bond! It's the best possible investment you can make, for peace — and your own peace of mind.

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 5850 Second Boulevard
WAREHOUSES in New York, Chicago and Los Angeles

ARMY NAVY

GTD GREENFIELD

TAPS • • • • • DIES • • • • • GAGES • • • • • TWIST DRILLS • • • • • SCREW PLATES

"This is a Grinding War . . ."

Copyright 1892 and 1920 by Harper & Bros.

FIGHTING TOP-

A terror in its day was the Gatling gun, shown here in the fighting top of an 1892 battleship. It was good as guns went then, when there was no such thing as production grinding, but modern weapons leave it far behind.

How did our fighting equipment make such progress in so few years.

Give a pat on the back to those who dreamed up the new designs—and to the far-seeing men who spark-plugged research in years of peace as well as war. Much credit, however, for the development of our precision ordnance must go to American mass production methods. But without grinding methods and processes, mass production as we know it could not exist.

Take the modern anti-aircraft gun. Every moving part must be ground to split-hair precision. It is this precision which enables the gun to fire with such deadly accuracy, so rapidly and so continuously.

And this goes for every other piece of fighting equipment, too. Every moving part in the engines which carry a plane, tank, truck, jeep, sub or ship into battle must be ground to closest tolerances.

Grinding is on the job even before production of these weapons begins.

The cutters, reamers, drills and broaches of machine tools that *make* machines of war must also be ground to close limits.

Carborundum has helped to develop many modern grinding processes in the past. And today, because "this is a grinding war," our engineers, research men—*all* of the men and women of Carborundum are working with redoubled energy.

Their contribution to the war effort received official recognition when the men and women of Carborundum were recently awarded the Army-Navy "E" Production Award. And they stand ready to make a similar contribution toward a better world of peace.

* * *

Every hour this war is shortened will save $12,000,000. The lives it will save are priceless. So please remember that grinding wheels, too, are "Weapons for Production" . . . use them wisely to help end the war sooner.

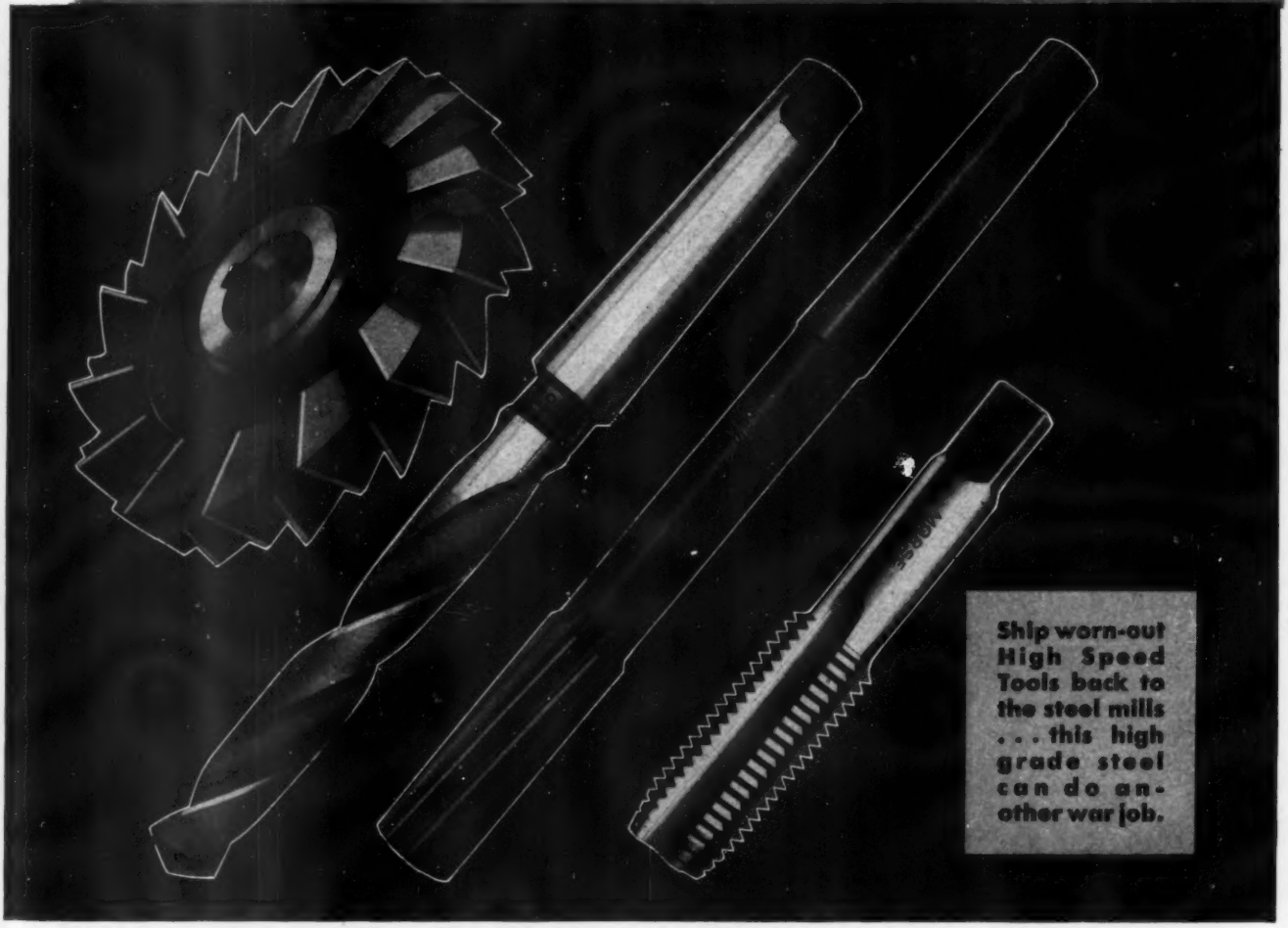
The Carborundum Company, Niagara Falls, New York.

THE CARBORUNDUM COMPANY

CARBORUNDUM AND ALOXITE ARE REGISTERED TRADE-MARKS OF AND INDICATE MANUFACTURE BY THE CARBORUNDUM COMPANY

TOOLS MUST BE ABLE TO TAKE IT, TOO!

• Only quality cutting tools have the stamina to stand up under today's heavy production schedules. Use MORSE Tools — tools that can take it!



Ship worn-out High Speed Tools back to the steel mills . . . this high grade steel can do another war job.

MORSE THERE IS A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

PRECISION GRINDING NEWS
NEW COOL-CUTTING GRINDING WHEEL LASTS 50 TO 100% LONGER
EXCLUSIVE DEVELOPMENT OF ELECTRO REFRACTORIES AND ALLOYS CORPORATION
BUILT TO HUG TOOL WITH LESS VIBRATION
ELIMINATES CHIPPING & BURNING TOOL EDGES
IMPROVES TOOL FINISH AND INCREASES TOOL LIFE

This is a real innovation — an entirely new precision grinding wheel, developed exclusively by Electro Refractories and Alloys Corp. for grinding Tungsten Carbide Tools.

It is new in design . . . new in composition. Improvements over conventional wheels used for this purpose are numerous and revolutionary. These are boiled down to five major points for your quick information. Details will be promptly furnished at your request.

1. GREATLY IMPROVED TOOL FINISH

Wheel is designed to hug the tool, thereby reducing the amount of pressure ordinarily required for sharpening. Result is far less vibration — hence, a vastly superior finish.

2. MUCH LONGER TOOL LIFE

Resiliency of wheel provides appreciably better finish — lengthening the productive life of tool.

3. NO BURNING OR CHIPPING OF TOOL EDGES

Exceptionally cool cutting action — eliminating damages to tool commonly caused by localized heating.

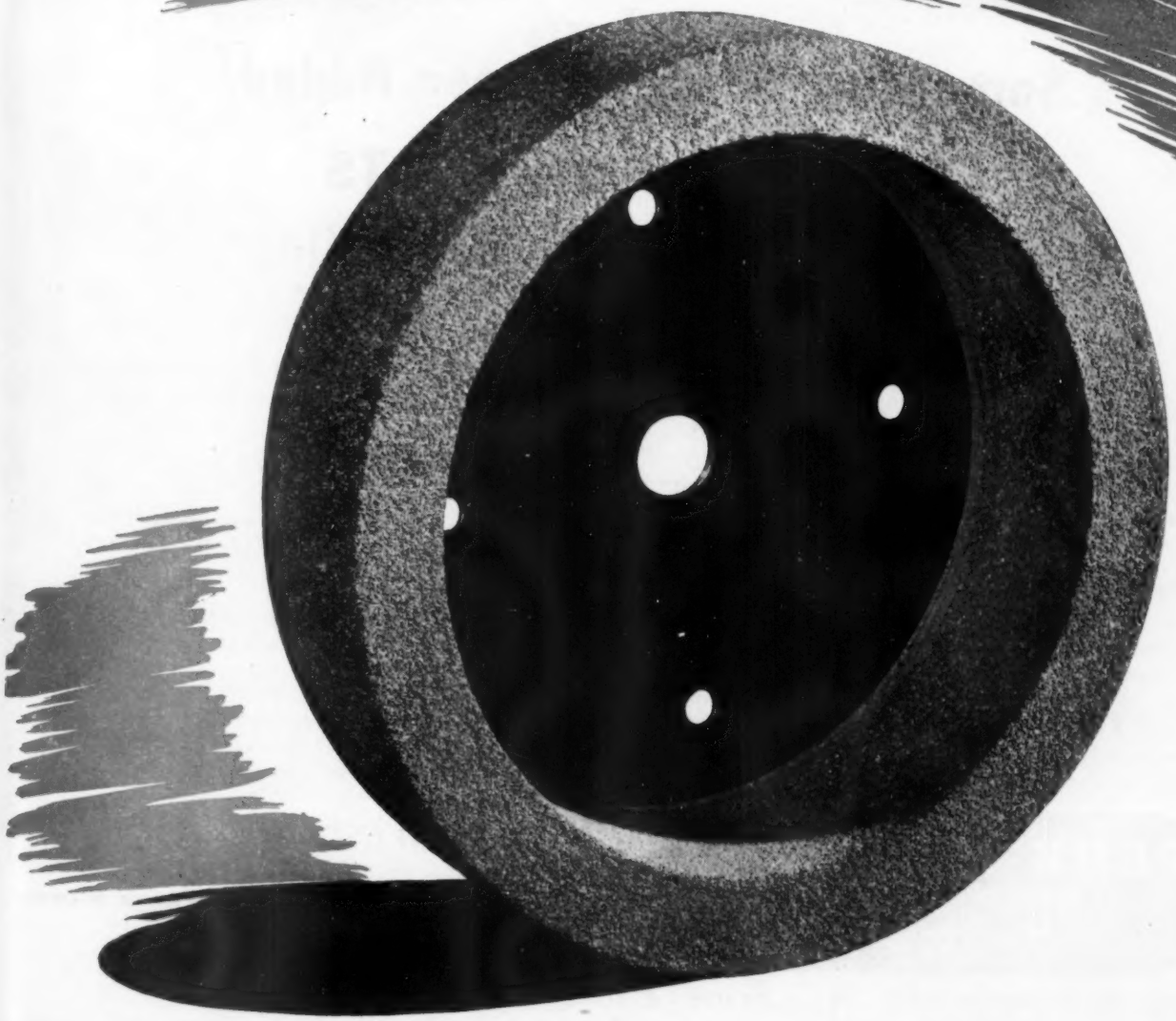
4. WHEEL LIFE INCREASED 50 TO 100%

Technical composition guarantees greatly improved durability — unmatched by conventional abrasive specifications.

5. AVAILABLE FOR PROMPT DELIVERY

Shipment of trial or production orders, properly identified by priority, can be made promptly.

ELECTRO'S NEW GRINDING WHEEL DEVELOPMENT REVOLUTIONIZES TUNGSTEN CARBIDE TOOL GRINDING!



ELECTRO REFRACTORIES AND ALLOYS CORP.

EXECUTIVE OFFICES: VARS BUILDING, BUFFALO 2, N. Y.

Manufacturers of Crucibles, Alloys, Stoppers, Refractories, Grinding Wheels

and Better

Something NEW Has Been Added!

METALITE CLOTH BELTS

Improve Swing Frame Grinding

Special, heavy-duty Metalite Cloth Belts on new type swing frame grinders are making amazing production records.

On many heavy metal grinding and snagging operations these fast, cool cutting abrasive belts with smooth running "Uniflow" joint, do a better job in less time at lower cost than solid or set up wheels on swing frame grinders.

Remove More Stock

Heavy-duty Metalite Cloth Belts are out-producing snagging wheels at rates of 4 and 5 to 1 in amount of stock removed.

Cut Faster

Stock removal is done more rapidly with grinding time reduced as much as 60%.

Cut Cooler

The larger cutting area of Metalite Cloth Belts generates less heat and assures faster dispersion.

Finish Better

These fast, cool cutting abrasive belts give far better finish than could possibly be secured from the rigid face of a coarse, solid snagging wheel.

Increase Production

More metal removed in shorter time gives desirable cumulative increase in hourly production.

Reduce Costs

All these advantages of Metalite Cloth Belts in swing frame grinding operations combine to lower costs and give a better product.

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

Be Sure to INVESTIGATE . . .
MAIL THIS COUPON

Please send folder on *NEW* Swing Frame Grinding Methods.

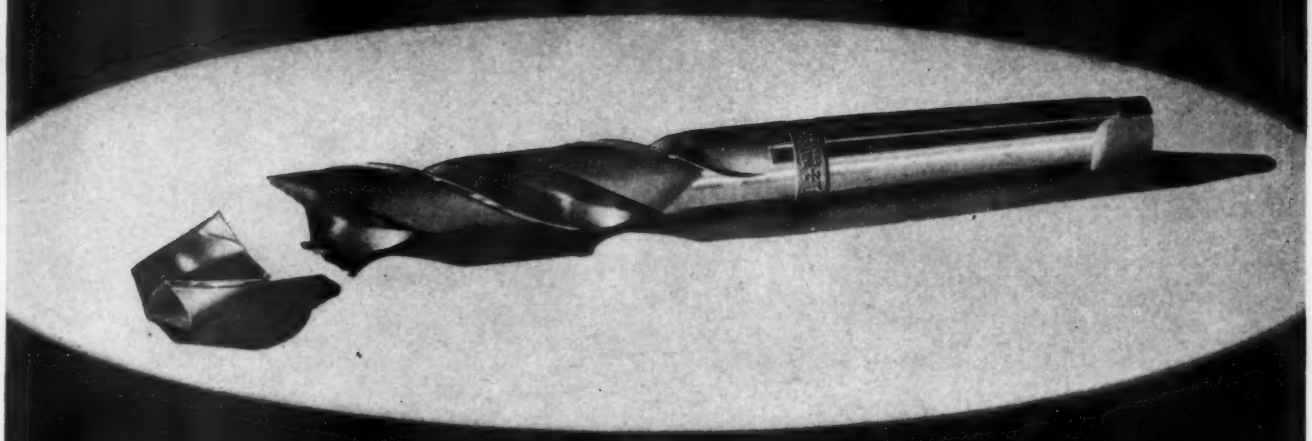
Firm Name .....

Street Address .....

City ..... State .....

by ..... Title .....

A BREAK FOR THE AXIS



Much tool breakage is caused by over-dulling. Cutting tools should be examined periodically while in action; they should be sharpened at regular time or production intervals, regardless of their apparent condition.

Besides being less liable to breakage, sharp tools will:

1. Last longer, because less material is removed when re-sharpening.
2. Produce more, and with better finish.
3. Insure utmost accuracy, with fewer rejects.
4. Reduce tool and labor costs per unit.

Sharp tools are economical tools. Keep them working for Victory!

NATIONAL

NATIONAL TWIST DRILL & TOOL CO. DETROIT U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

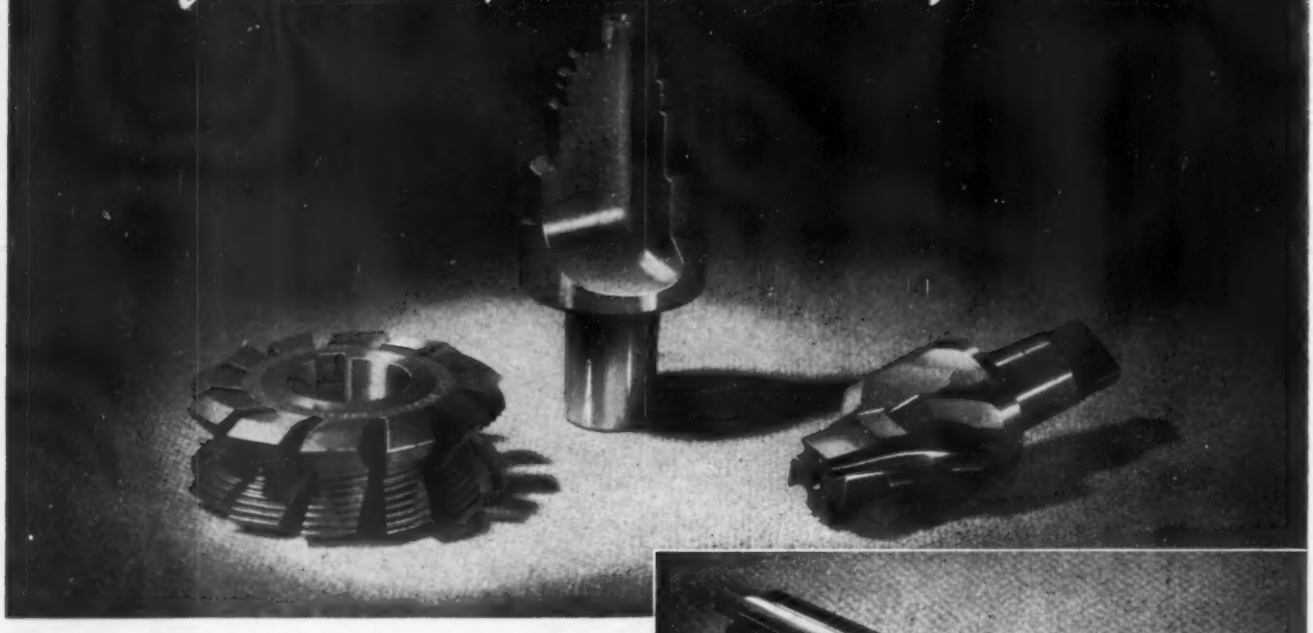
TWIST DRILL AND TOOL COMPANY

HOME OFFICE AND FACTORY—DETROIT, MICH.

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

THE LONG LIFE . . . THE ACCURACY
of these Special Cutting Tools



A combination drill and step reamer in which the flutes extend for the full length of the tool. As cutting edges become worn, the flutes can be cut back, providing the tool with extremely long life.

Are Helping to Speed Production of GUNS and SHELLS

Some of the most unusual and "difficult to produce" high speed steel cutting tools have been and are being manufactured by Morse Tool Company.

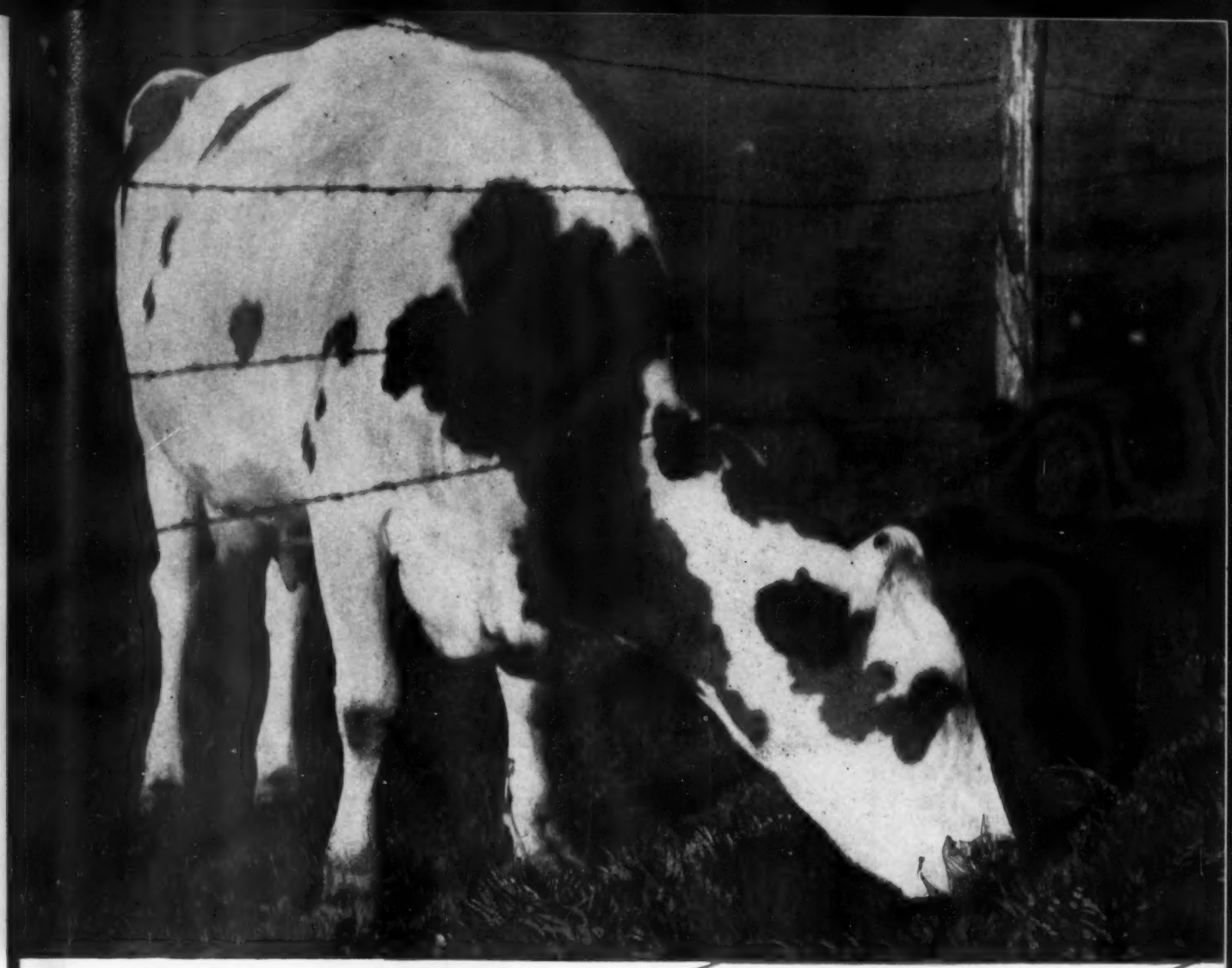
Among the many special tools produced by this company are various types of reamers such as those pictured here. Other Morse Tool products include special milling and form relieved cutters, as well as complete lines of standard tools.

If your present needs call for high speed cutting tools made exactly to the tool design, dimensions and tolerances shown on your drawings, Morse Tool Company can meet your requirements. Today, and in your post-war production, the experience of this company can prove invaluable in helping you to reduce costs and get greater efficiency in your cutting operations.

A reamer used in shell manufacture. This tool has a special lubricating and chip removal feature. Lubricant comes through a hole in the center of the tool and emerges from holes at end, forcing chips back and preventing packing or clogging in cutting operations.

Morse Tool Company

116 E. GOLDENGATE ST.
DETROIT • MICHIGAN



"THE GRASS IS *Always* GREENER . . "

Need we finish it? . . . "on the other side of the fence."

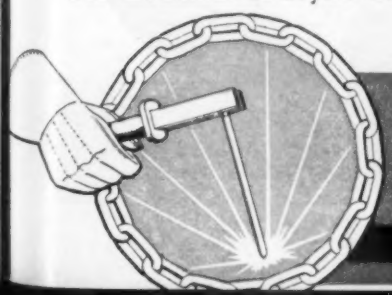
Here at The McKay Company we have no illusions about the very human tendency of most individuals to "shop around" a little in their quest for something better. And because of that deeply ingrained habit The McKay Company and the McKay line of products has grown in importance and reputation and usefulness.

For thousands of buyers who came to "nibble" have stayed to "graze" . . and other thousands, tempted elsewhere for awhile, have returned to the safe, dependable source of recurring satisfactory supply.

If it's stainless or mild steel Welding Electrodes or Commercial Chain you need (Tire Chains, too, although they may not be in your line), the reputation of these McKay products is sustained by 60 years of dependable service to industry

Try them sometime!

Sales Offices: York, Pa.



THE McKAY COMPANY
PITTSBURGH, PA.

WELDING ELECTRODES . . . COMMERCIAL CHAINS . . . TIRE CHAINS

"MORE PRODUCTION, BETTER FINISH, REJECTS ELIMINATED—Grinding Airplane Cylinder Valve Seats"

writes
POR-OS-WAY'S
WAR PLANT REPORTER

Dear Charlie:

I'm writing this from the [redacted] plant, and here's more bad news for the Axis.

The use of Por-os-way is producing one additional airplane barrel, with valve seats precision-ground, every working hour. Multiply that one out, and you can see that Por-os-way's got something — something that the Axis doesn't like.

So long 'til next report

Your roving reporter

"Vic"

THE JOB:
Removing .010" to .012" from valve seats of airplane cylinder barrels on a Waddell Valve Seat Grinder—wet grinding at 5,000 R.P.M.

THE WHEEL:
Por-os-way 3¼" x ⅜" x 1⅛" C80 HV3.

All facts and figures given are taken from an actual field survey made by a Por-os-way correspondent.

WRITE for complete booklet "Facts About Por-os-way". The address is 430 Wheatland St., Phoenixville, Pennsylvania.

THE RECORD	POR-OS-WAY	FORMER WHEEL
Pcs. per Hour (2 Seats per Cylinder Barrel)	5*	4
Dressings	None	3 per wheel
Pcs. Per Wheel	300-375	120-150
Life of Wheel	1½ days	1 day
Average Depth of Cut	.005"—.008"	.001"—.003"
Rejects	None	2%
Finish	Superior	———

*Conservative. Por-os-way has proved ability to grind 8 pcs. per hour, or 100% more than former wheel.

Remarks (by foreman). "My men take pride in their work. If a wheel is too hard and burns work, it means lost time and material and gets them sore. We are sold on the merits of Por-os-way."

2 TO 5 TIMES MORE WAR PRODUCTION PER MAN PER MACHINE

POR-OS-WAY* *a new* RADIAC* PRODUCT

A. P. DE SANNO & SON, INC.
NEW YORK, CHICAGO, PITTSBURGH, CLEVELAND, DETROIT, LOS ANGELES

PHOENIXVILLE, PENNA.
Western Gateway to VALLEY FORGE

*T. M. Reg. U. S. Pat. Off.

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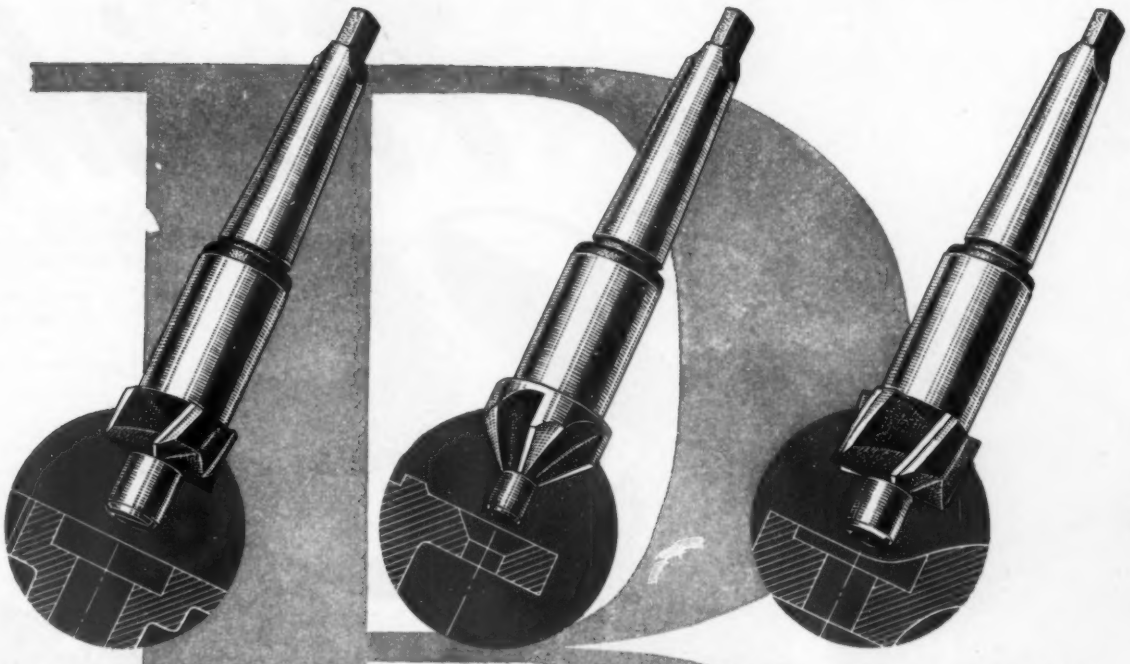


PRESCRIPTION FOR THE TOOL ROOM:

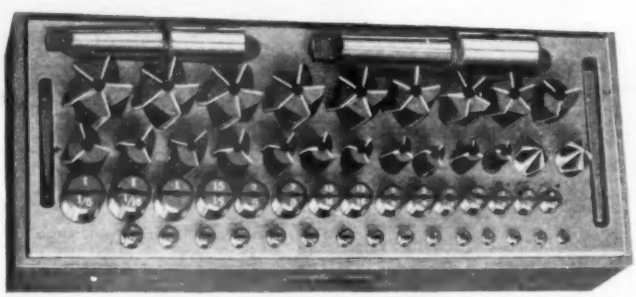
Gairing Interchangeable Counterbore Sets

In tool rooms, machine, die and repair shops, Gairing **Interchangeable** Counterbore Sets provide the proper prescription for all counterboring, countersinking and spot-facing operations. They are adaptable, dependable friends, good medicine neatly boxed in sturdy wooden cases with stout hinged covers.

There are seven sets from which to choose. Set C-13 is illustrated here. Each contains a logical assortment of **interchangeable** counterbores, countersinks, pilots and holders. Every tool in every set is designed with special features to meet a wide variety of requirements.

The **interchangeable** holders in these sets are of Morse Taper or straight shank type (optional). Threaded shank pilots are of selected alloy steel hardened and ground on the head. Shanks are drawn and treated to obtain unusual toughness and strength. High speed steel counterbores are renewable. All counterbores, pilots and holders selected are standard items of the most active sizes used. Replacements may be quickly obtained from stock.

The use of these interchangeable assemblies assures large savings over the old-fashioned solid integral pilot type.



Gairing Interchangeable Counterbore Set No. C-13, that provides two hundred and eighty-one various combinations of pilots and cutters, interchangeable in two holders for counterboring and spot-facing holes from $\frac{9}{32}$" to $1\frac{1}{8}$" inclusive. Counterbore sizes range from $\frac{9}{16}$" to $1\frac{3}{4}$". **Six other sets are available with smaller and larger tools.**

GAIRING
FOR OVER A QUARTER CENTURY SPECIALISTS IN FINE CUTTING TOOLS

Gairing TOOLS

Write us today for our four-page Counterbore Bulletin illustrating, describing and pricing all seven sets.

THE GAIRING TOOL COMPANY, Detroit 32, Michigan

Manufacturers of Standard, Special and Gair-Lock Inserted Blade Cutting Tools

Finishes

EXCELLENT

GOOD

FAIR

POOR

VERY POOR

FASTER CUTTING

The better cooling and lubricating job performed by Tycol Soluble Cutting Oils is effecting material savings in time and enables greater output even on the toughest of steels.

LONGER TOOL LIFE

Tools that work under Tycol Soluble Oils have a long useful life. Regrindings are cut materially and the problem of chips welding to the tool is minimized.

FINER FINISHES

Tycol No. 665 remains in constant emulsion—keeps the cutting tools sharp to assure finer finishes. This important consideration led thousands of machine tool users to insist on Tycol.

with TYCOL Cutting Oils

Principal Branch Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

TIDE WATER ASSOCIATED

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL

improved when

1/40 REPLACED 1/20

Here's what one big eastern ordnance manufacturer discovered when he changed to Tycol 665 Soluble Oil:

On cylindrical and centerless grinding of shells, Tycol 665 produced excellent finishes when mixed one part Tycol to 40 parts of water. With the oil previously used, the mixture had been one part oil to 20 parts water—or twice the concentration required with Tycol. Moreover, this manufacturer reports that with Tycol 665, grinding wheels give excellent output between facings.

This case parallels the experience of hundreds of manufacturers who have changed to Tycol cutting oils. Finer finishes, longer tool life, and faster cutting are being achieved on thousands of machining operations, with resultant production increases and savings in material. And in most cases, Tycol oils add to these benefits a desirable economy in oil consumption and costs.

There is a complete line of Tycol cutting oils specifically engineered for every machining requirement. A Tide Water engineer will be glad to recommend the oil best suited to your particular job. Call or write today to your nearest Tide Water office.

Tide Water Oil Co. of Canada, Ltd. • Toronto—Montreal

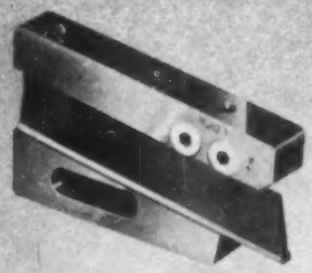
OIL COMPANY

Eastern Division: 17 Battery Place, New York 4, N. Y.

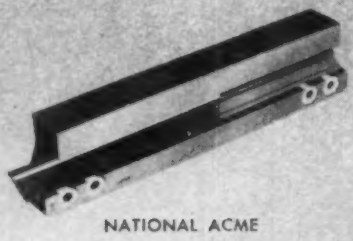
INDUSTRIAL TYCOL OILS-GREASES

DRUMS! DRUMS! DRUMS!
War needs make it extremely important that all empty drums be returned immediately

EMPIRE TOOL COMPANY'S LUERS PATENTED
CUTTING-OFF BLADES AND HOLDERS

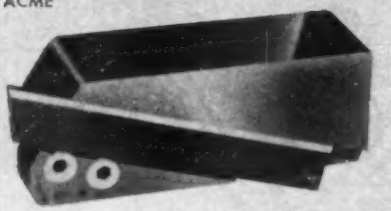


GRIDLEY AUTOMATIC—
3¼ AND 4¼—SINGLE SPINDLE

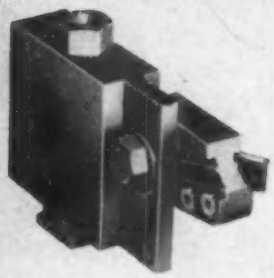


NATIONAL ACME

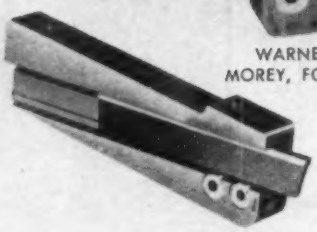
NEW BRITAIN AUTOMATIC



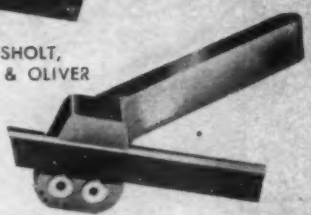
WARNER & SWASEY, GISHOLT,
MOREY, FOSTER, BARDONS & OLIVER



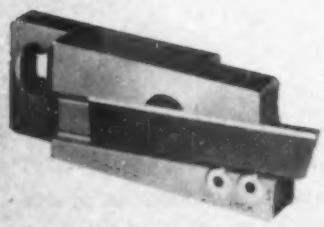
BROWN AND SHARPE



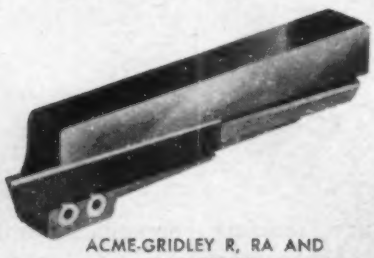
CONE AUTOMATIC



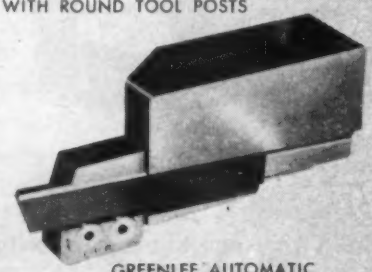
LATHE & HAND SCREW MACHINES
WITH ROUND TOOL POSTS



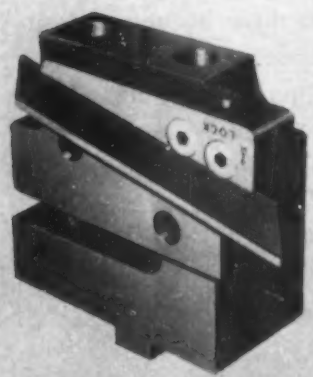
CLEVELAND B VERTICAL
CUT-OFF



ACME-GRIDLEY R, RA AND
RAS SERIES



GREENLEE AUTOMATIC
4- AND 6-SPINDLE



GRIDLEY MODELS F & G
AUTOMATICS—4 SPINDLE

Empire Tool Company manufactures Luers Patented Cutting-Off Blades and Holders under license issued by John Milton Luers Patents, Inc.

THE BLADES THAT REDUCE FRICTION

MADE TO FIT ANY HAND OR AUTOMATIC SCREW MACHINE

They are today in use in every leading plant in the country where the production of war requirements is dictating speed in cutting-off operations.

Luers Blades eliminate excessive friction, therefore reduce breakdowns. They require less frequent grinding, therefore show longer productive periods.

Luers Holders are so designed as to permit quick removal and replacement of blades without disturbing original setup. The top clearance, or rake, which has been incorporated in them eliminates hand grinding of lip on top of blade—a time-saving factor.

There are many more important reasons why you should be using these blades and holders. Better send for a complete catalog showing the particular type that will fit your machines.

Yes, we have a holder for your machine, even if it isn't shown here.

BUY WAR BONDS

EMPIRE Tool Co.

8778 Grinnell Ave., Detroit 13, Mich.

W.O.#1

THE GOVERNMENT-APPROVED PHOSPHATIZER WHICH EXCELS IN AIRCRAFT MAINTENANCE

MAKES PAINT STICK TO ALL AIRCRAFT METALS (Except Magnesium). Removes and Prevents Corrosion. For preparing aluminum and other alloy parts before painting. For removing lead stains caused by ethyl gasoline combustion.

TURCO W. O. #1, the rapid, low-cost phosphatizing method used extensively by many aircraft manufacturers, is versatile—quick and dependable in action and easy in application. This process is equally successful either for completely assembled units or for touch-up work.

TURCO W. O. #1 provides the required passivation for aluminum and aluminum alloy surfaces, as well as all other structural metals except magnesium. It provides maximum adhesion for paint and other finishes. It inhibits rust, thus preventing oxidation of any exposed area.

TURCO W. O. #1 is easily applied by hand or by tank immersion. The customary dilution is 1 part TURCO W. O. #1 to 4 parts water. The hand method requires only the use of a sponge or brush. Rinse with clear water and wipe dry with clean rags. For smaller parts, use tank method. Immerse in solution for 15 minutes; then rinse thoroughly.

TURCO PRODUCTS, INC.

SPECIALIZED INDUSTRIAL CHEMICAL COMPOUNDS

Main Office and Factory: 6135 South Central Ave., Los Angeles 54. Midwest Factory: 4856 So. Halsted St., Chicago. Service Representatives and Warehouse Stocks in All Principal Cities.

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TURCO PRODUCTS, INC.
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We want our problem solved. Send 60-page booklet "Anodizing, Chromatizing, Phosphatizing."

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ON YOUR LETTERHEAD, PLEASE

IN WELDING "STAINLESS"

IT IS ABSOLUTELY ESSENTIAL THAT THE ELECTRODE YOU USE GIVES A DEPOSIT THAT EQUALS THE STAINLESS STEEL THAT YOU ARE WELDING

You can depend on always being able to select the correct electrode from the complete line of **PAGE-*Allegheny* STAINLESS STEEL ELECTRODES**—each of which has been developed and tested in close collaboration with the world's largest tonnage producers of Stainless Steel.

Ask your local PAGE Distributor for a copy of the well illustrated booklet that gives complete instructions on the selection of the correct Stainless Steel Electrodes for the Stainless Steel you are welding.

PAGE WELDING ELECTRODES

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In Business for Your Safety

AMERICAN CHAIN & CABLE COMPANY, Inc.

BRIDGEPORT • CONNECTICUT

Announcing Two Revolutionary Inventions . . .

SpeediChuk

WITH THE **Precision BREN COLLET**

Increases 1/2" Collet Capacity Lathes to 3/4"

- **Fits ATLAS, LOGAN, SOUTH BEND, CLAUSING Lathes and others with a 1½" x 8 Thread Spindle Nose having a No. 3 Morse Taper on inside**

NOW when collet work on round stock up to ¾" is indicated, use SPEEDICHUK and the uniquely designed BREN Collet in your small lathes . . . *Free the heavier machine tools for other war duties.* Easily installed, SPEEDICHUK requires no adapter plate. It is the only collet chuck using a floating closing sleeve which compensates for wear and misalignment of the lathe spindle. The BREN Collet utilizes maximum spindle accuracy for the first time by combining tapered closing sleeve on body of the collet.

Immediate Delivery From Stock

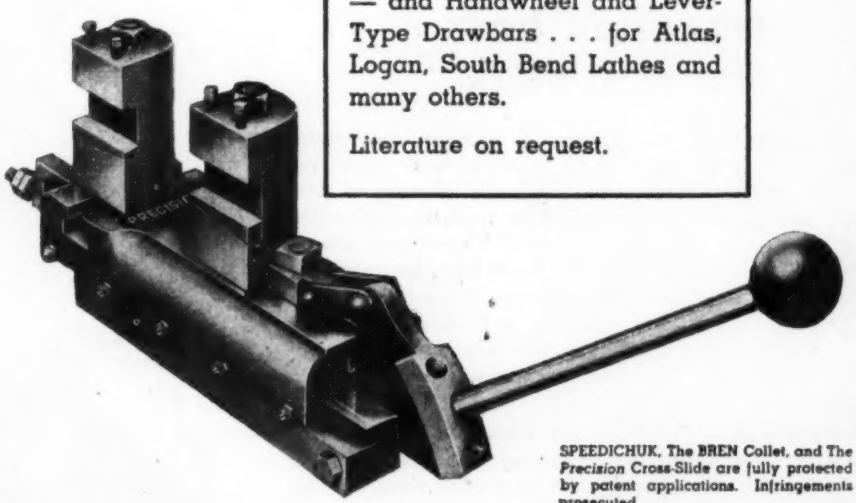
THE NEW Precision LEVER TYPE CROSS-SLIDE

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**

A sturdily constructed job, the *Precision* Lever Type CROSS-SLIDE has a capacity of 2½". Built into it are many important features not usually found in a single unit . . . Three separate models fitting ATLAS, LOGAN, 9" SOUTH BEND Lathes. Can also be adjusted to any other bench lathes.

Your dealer can supply you with the new *Precision* lathe attachments. Also ask him for *Precision* Collet Models 3AT, 3C, 5C, 480 (Same as W. & S. No. 1) — and Handwheel and Lever-Type Drawbars . . . for Atlas, Logan, South Bend Lathes and many others.

Literature on request.

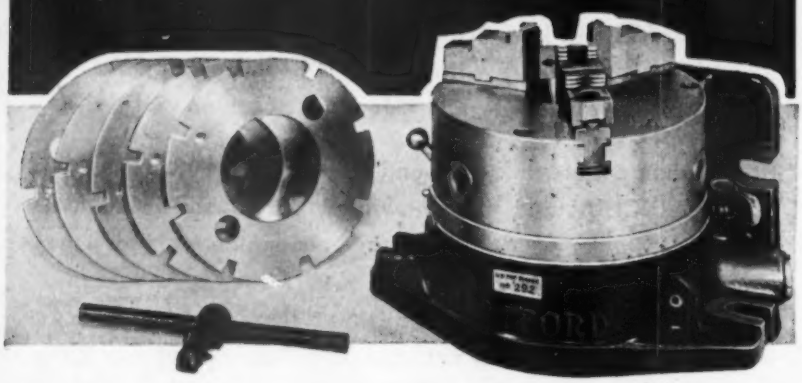


Precision Collets and Drawbars

SPEEDICHUK, The BREN Collet, and The *Precision* Cross-Slide are fully protected by patent applications. Infringements prosecuted.

GENERAL DIE - STAMPING - TOOL COMPANY
PRECISION COLLET DIVISION, 265 Canal Street, New York 13, N. Y.

The HARTFORD SUPER-SPACER *speeds production by* SAVING SET-UP TIME



Many war busy shops are taking advantage of this modern, sturdy spacing device to speed up milling, drilling, slotting, planing and jig boring operations. Not only does the SUPER-SPACER save set-up time, but assures accuracy under heavy cuts. Mask plates eliminate all chance of error.

The Hartford SUPER-SPACER is foolproof, rugged, simple to operate and can be depended on to hold work securely. The fact that it can be used in either a horizontal or vertical position greatly extends its utility.

LET US SHOW HOW YOU, TOO, CAN SPEED UP PRODUCTION

Send today for illustrated literature showing some of the many applications of the SUPER-SPACER which are speeding up production.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

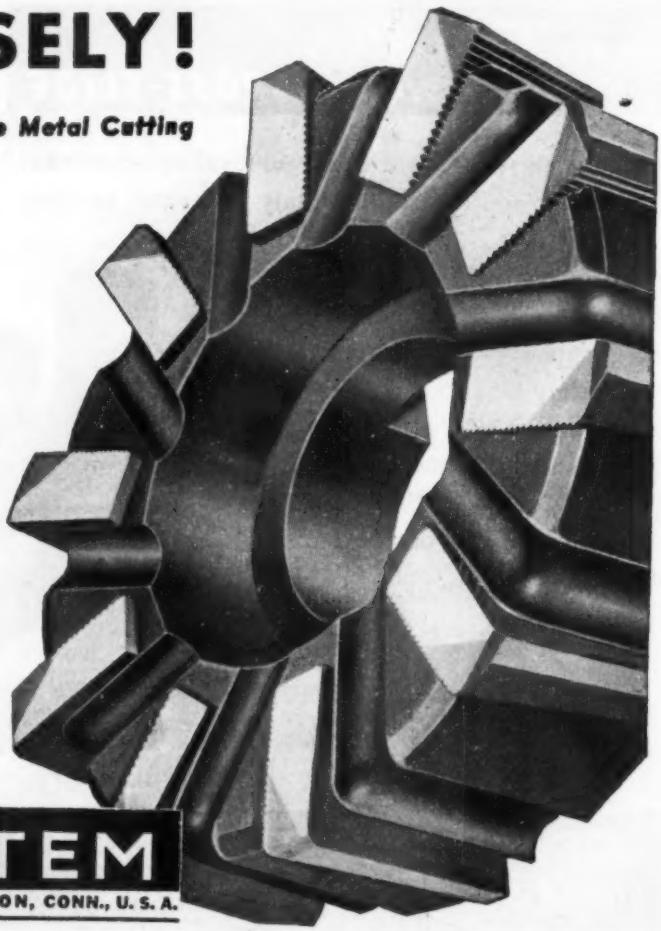
STUDY IT CLOSELY!

This is one of a wide variety of O K Inserted-Blade Metal Cutting Tools which in this war —

Save MAN-HOURS
OPERATION COST
AND H. S. STEEL

Milling, reaming, boring, turning, planing — all metal cutting — can be speeded up, and the work improved, by the systematic use of O K Tools. Compared with solid cutters, accuracy is thus easier to obtain and maintain. With an adequate supply of blades and bits at hand, there need be no costly waits for new cutters to fit the job. O K Tools are quickly adjustable in line of wear; the truing and grinding are little more than routine. And, an entire new tool is not necessary for most special cuts; the change can usually be made in the blades.

As the bodies of O K Tools are made of alloy steel and only the blades and bits of cutting steel, the saving of critical High Speed Steel, even in a small shop, can be an important contribution to the war effort!



INSERTED-BLADE METAL CUTTING
TRADE OK MARK
TOOL SYSTEM
MANUFACTURED ONLY BY THE O K TOOL COMPANY, SHELTON, CONN., U. S. A.

JUST OUT!

SURFACE SPEED TABLE AND TOOL SELECTOR

RED SHADED AREA INDICATES GENERAL HIGH SPEED STEEL CUTTING RANGE

YELLOW SHADED AREA INDICATES GENERAL TANTUNG CUTTING RANGE

BLUE SHADED AREA INDICATES GENERAL CEMENTED CARBIDE CUTTING RANGE

TABLE OF SURFACE SPEEDS PER MINUTE

REVOLUTIONS PER MINUTE

HIGH SPEED STEEL

TANTUNG

CEMENTED CARBIDE

Kennametal

CORPORATION

WESTERN UNION

1201

SYMBOLS

DL = Day Letter

NL = Night Letter

LT = Cable Night Letter

Ship Radiogram

CLASS OF SERVICE

This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.

1943 AUG 5 PM

A. N. WILLIAMS PRESIDENT

NEWCOMB CARLTON CHAIRMAN OF THE BOARD

J. C. WILLEVER FIRST VICE-PRESIDENT

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PRODUCTION MANAGER=

ANY DEFENSE PLANT

NEW TABLE OF SPEEDS, FEEDS AND TOOL SELECTOR JUST OFF PRESS. PRINTED IN FOUR COLORS TO GIVE INSTANT SELECTION OF CORRECT CUTTING TOOL. ONE GLANCE SHOWS WHEN TO USE HIGH-SPEED STEEL, TANTUNG OR CARBIDES TO THE BEST ADVANTAGE. CHART IS PRINTED ON HEAVY STOCK, PUNCHED AND READY TO HANG. ONE OR MORE WILL BE SENT TO YOU WITHOUT COST OR OBLIGATION. PLEASE ADVISE THE NUMBER OF CHARTS YOU WILL NEED FOR YOUR PLANT=

VASCOLOY-RAMET CORPORATION.

A327

VASCOLOY-RAMET CORPORATION · NORTH CHICAGO, ILLINOIS

Here's your copy

OF THE

NEW CATALOG on BOICE-CRANE 15" DRILL PRESSES

JUST OFF THE PRESS!

Every production engineer should have this interesting new booklet.

It describes in detail the entire line of 75 models in Boice-Crane 2600 series Helmet Heads and the 1600 series Drill Presses . . . the one make of precision drill presses that includes a model for most tooling needs. Standardizing on one make simplifies and reduces the cost of maintenance. The section on Boice-Crane Tapping Heads for Helmet Head Drill Presses tells how to do light tapping better, cleaner and more economically.

This new book contains engineering data and suggestions for incorporating Boice-Crane Drill Press heads, parts and work tables into special machines, and cost-reducing, labor saving fixtures for doing all kinds of jobs quicker and easier.

Handy, time-saving accessories that increase the work range of these sturdy, flexible machines are also described.

Write today for this catalog on versatile, portable, low-cost Boice-Crane Drill Presses now doing such a fine job in thousands of war plants.

FOR NEW FREE DRILL PRESS CATALOG USE THIS COUPON

BOICE-CRANE COMPANY • 935 Central Ave., Toledo 6, Ohio

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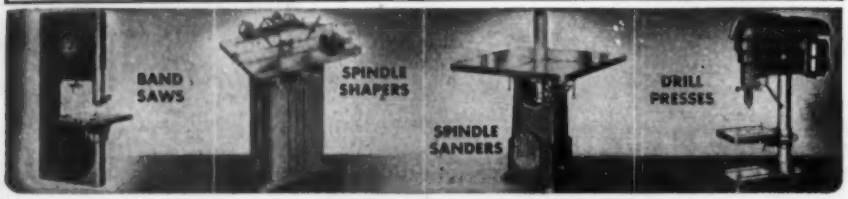
City_____



READ WHAT

George E. O'Neill
Safety Engineer of Bendix
MARINE DIVISION

THINKS ABOUT SPEEDI-DRI

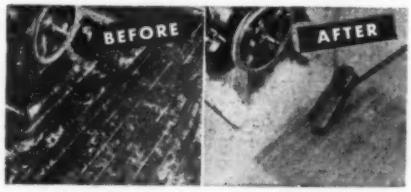
OIL AND GREASE ABSORBENT

Writing to the Editor of a safety magazine, Mr. George E. O'Neill, Safety Engineer of the Marine Division of Bendix Aviation Corporation, says, in part: "Oil absorption by the use of sawdust . . . is both unsanitary and inflammable, creating a great fire hazard. Prior to the use of SPEEDI-DRI we risked this unhealthy condition but now our floors and platforms are kept continually clean with SPEEDI-DRI. I believe that facts about products of this nature should be passed on to others . . ."

Mr. O'Neill might also have added that SPEEDI-DRI provides an immediate, non-skid surface, soaks up oil and grease from wood, steel, or concrete floors, brightens up the plant, saves shoes from oil rot, protects workmen's feet and is especially effective where women are employed. By its ease of application and removal, SPEEDI-DRI saves vital manpower and cleaning costs. No expensive machinery or scouring compounds are necessary.

Thousands of plants are now using SPEEDI-DRI in preference to all other oil-absorptives, because it gives more protection per pound at less cost.

Try SPEEDI-DRI in your plant. It will work wonders for you. Prompt service from warehouse stocks in leading cities. Unlimited, priority-free supply.



Ask for a demonstration . . . or write for a free, testing sample. If you use water-soluble oils or if water is also present, specify SOL-SPEEDI-DRI.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

SUPPLIERS

East — **REFINERS LUBRICATING CO.**
New York 1, N. Y.

Midwest and South
WAVERLY PETROLEUM PRODUCTS CO.
Philadelphia 6, Pa.

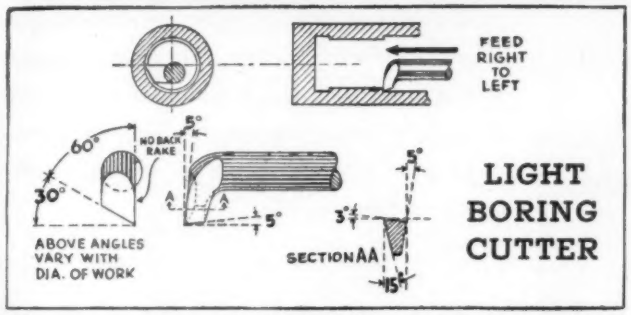
West Coast
WAVERLY PETROLEUM PRODUCTS CO.
Russ Bldg., San Francisco 4, Calif.

HOW AND WHY

WILLIAMS' TOOLS AID WAR PRODUCTION

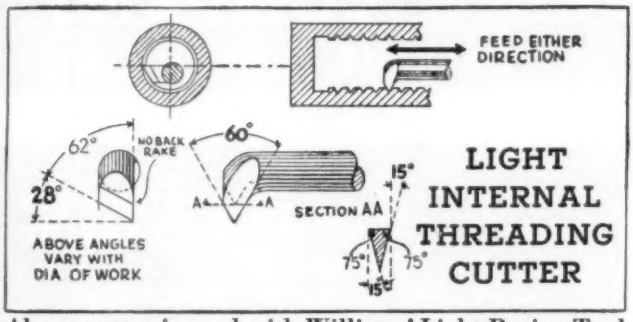
GRINDING CUTTERS FOR WILLIAMS' TOOL HOLDERS

DATA SHEET B, covering the various cutters used with Williams' Boring Tools in machining cast iron and steel.



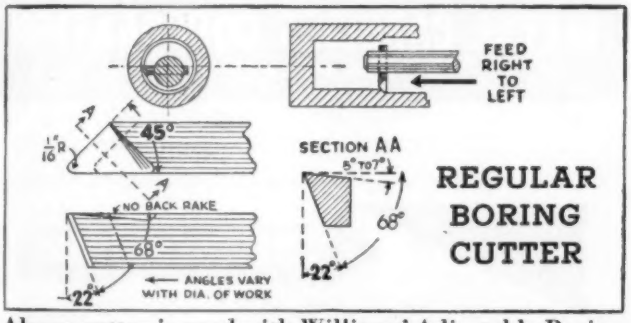
LIGHT BORING CUTTER

Above cutter is used with Williams' Light Boring-Tool Holders, Nos. 15, 16 & 17. Grinding instructions for the square, turning cutter furnished with these Holders were given in DATA SHEET A of this series.



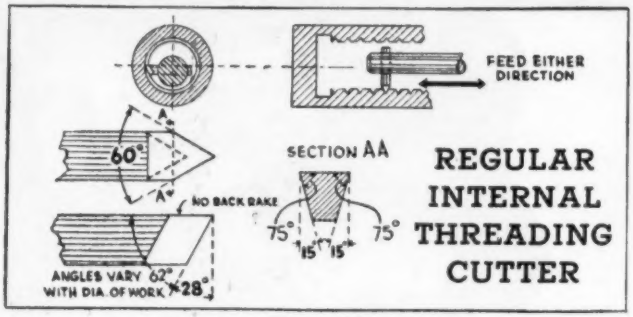
LIGHT INTERNAL THREADING CUTTER

Above cutter is used with Williams' Light Boring-Tool Holders, Nos. 15, 16 & 17. Instructions given are for regrinding for internal thread cutting. This cutter is furnished ground for boring as in first illustration.



REGULAR BORING CUTTER

Above cutter is used with Williams' Adjustable Boring Tool Posts Nos. 2, 3, 4 & 5 and with Williams' Boring Tool Holders, Nos. 080, 80, 81, 82 & 83.



REGULAR INTERNAL THREADING CUTTER

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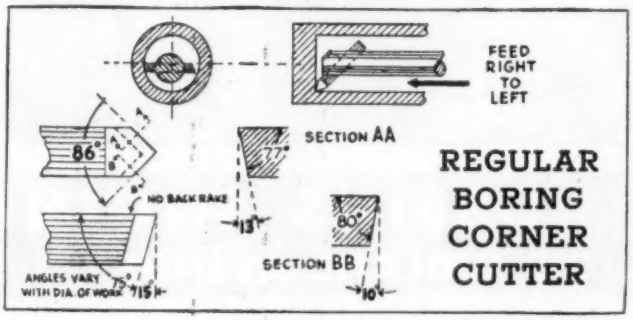
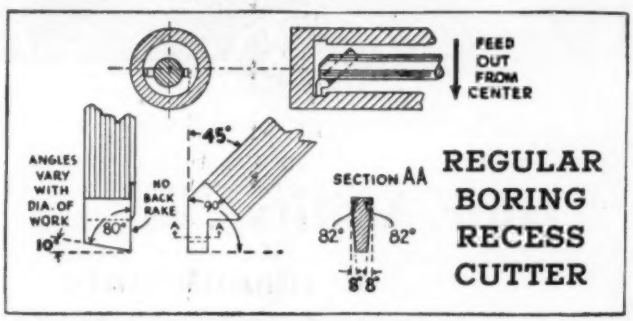


REGULAR BORING CORNER CUTTER

Above cutter is used with Williams' Adjustable Boring Tool Posts Nos. 2, 3, 4 & 5 and with Williams' Boring Tool Holders, Nos. 080, 80, 81, 82 & 83.



REGULAR BORING RECESS CUTTER

Above cutter is used with Williams' Adjustable Boring Tool Posts Nos. 2, 3, 4 & 5 and with Williams' Boring Tool Holders, Nos. 080, 80, 81, 82 & 83.

Data Sheet A on this subject appeared last month. Additional Data Sheets on the grinding of other cutters for Williams' Tool Holders will follow.

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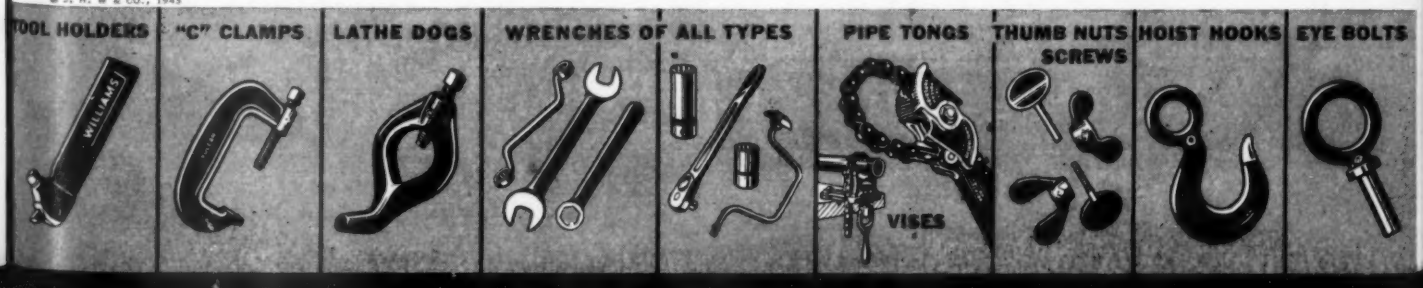

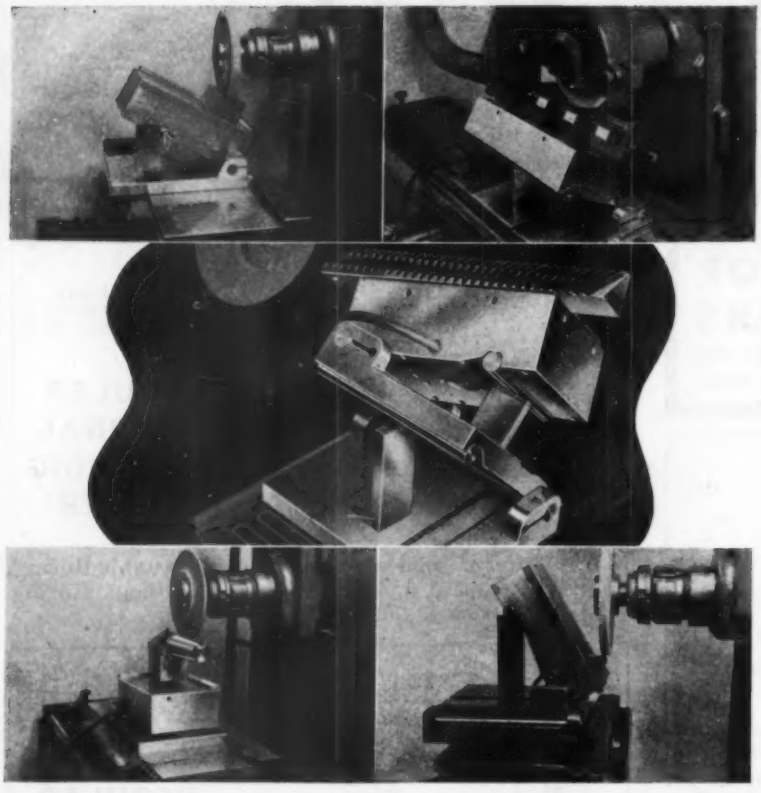

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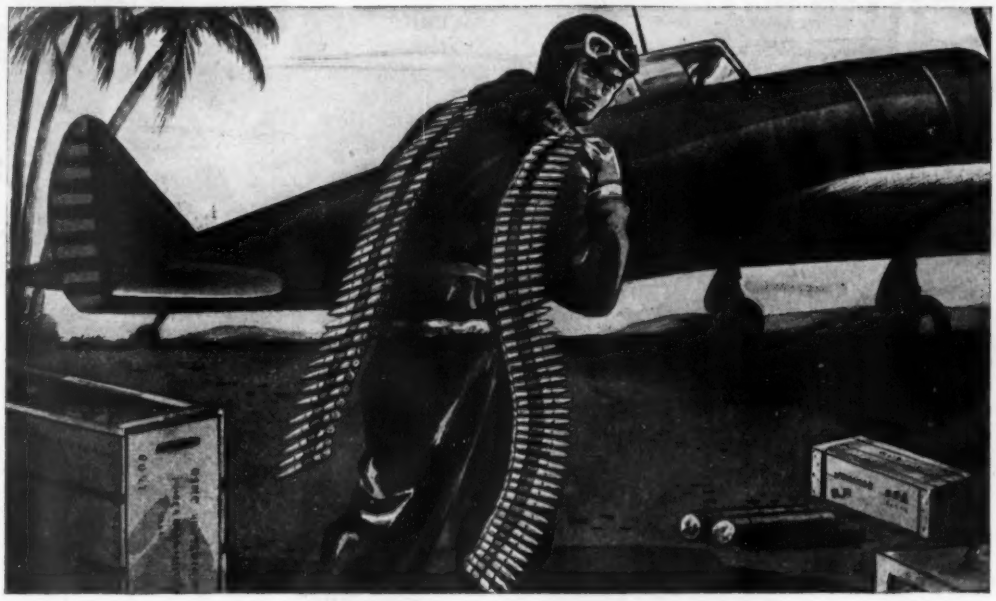

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M-9

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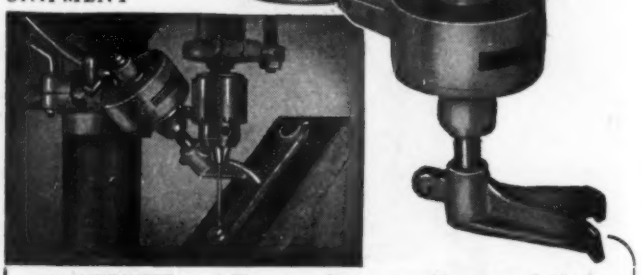
For **GREATER DRILL-PRESS OUTPUT**

PROMPT SHIPMENT



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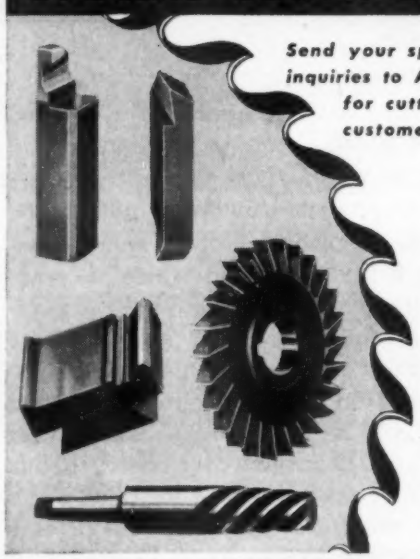

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You'll get with BETTER SURFACE GRINDING

DIAGONAL SHEARING

PRODUCTION TEST

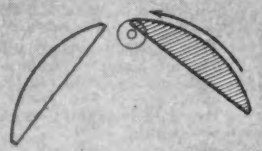
Production Test Run on Hanchett No. 36 Vertical Surface Grinder with 36" dia. magnetic table. Wheel speed, 695 R.P.M.

WORK: Gears—cold rolled steel hardened: 7.51 sq. in. surface ground per piece; 45 pieces per table load.

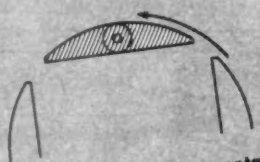
	CORTLAND	Brand Formerly Used
Cubic inches of stock removed per inch in height of segments	76.5	64.3
Ampere Readings	60 to 70	70 to 80
Dressings Necessary	None	2
Work Heat?	Cool	Burned
Grinding Time	8 min.	15 min.

Cortland shape Segments produced better finish with less wheel wear, and much faster grinding time.

DIAGONAL SHEARING



Shock and resistance minimized as narrow end of segment starts grinding action. Large surface still exposed to coolant. Diagonal motion of straight inner edge of segment produces powerful shearing action. Increasing contact combines rapid stock removal with minimum heating.



Maximum area of segment in contact with work momentarily. As segment continues to pass across work, grinding area becomes smaller, with more surface exposed to coolant.

CORTLAND *Segmental Chucks*

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48 Page Handbook

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THIS valuable data book will aid you in selecting the proper tools to speed production—solve difficult cutting problems.

MATCO methods of manufacture for formed—relieved and other types of cutters are based on a production sequence to meet the demand for speedy delivery of precision cutters. Controlled production and inspection guarantees quality and accuracy.

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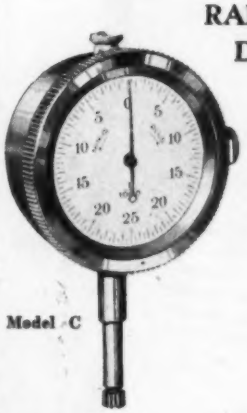

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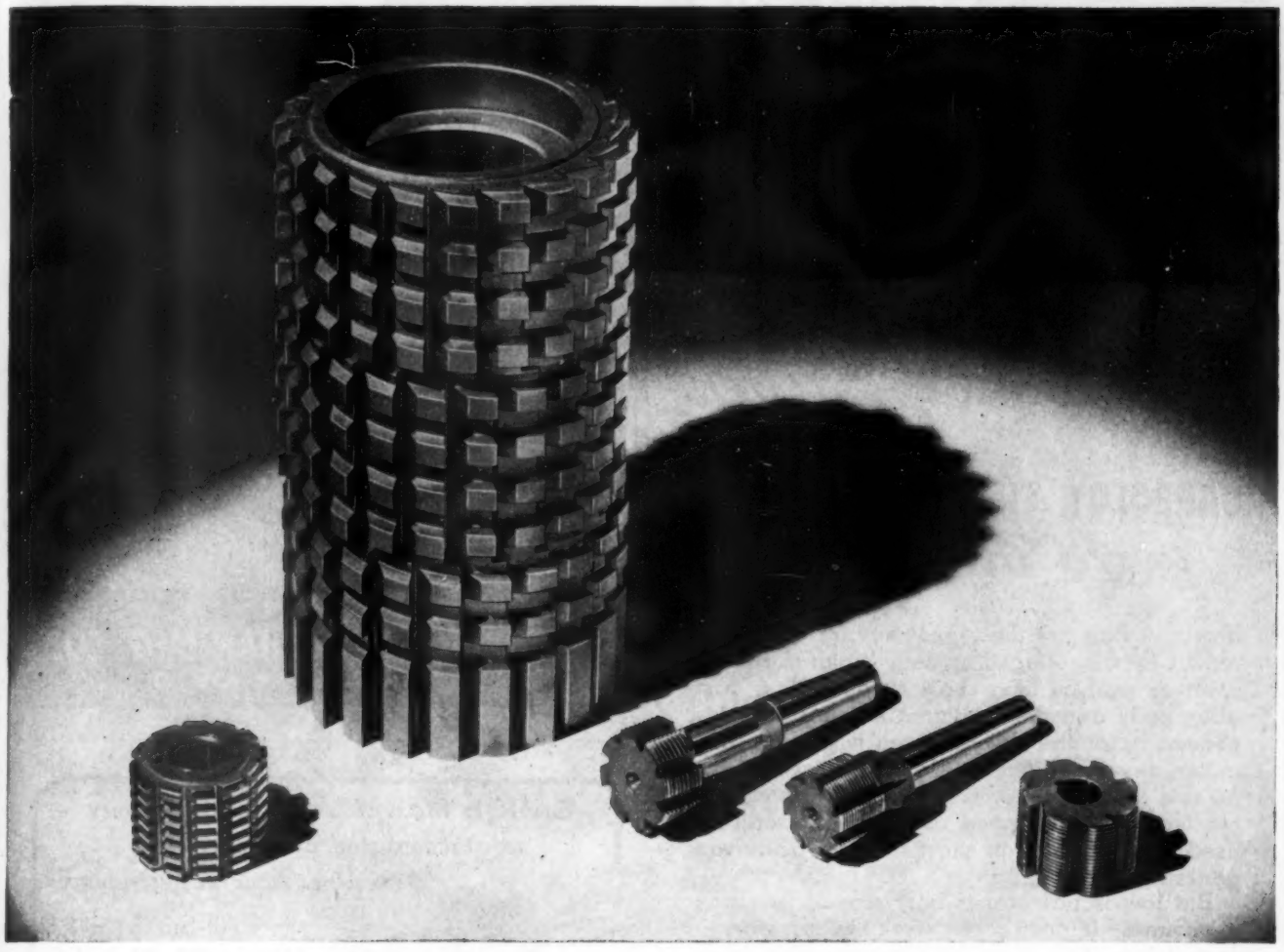

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Available in 3" to 8" diameters with 4 or 6 flutes for cast iron, brass, bronze, copper, aluminum, magnesium, and plastics. For steel, 6 to 16 flutes are used according to the diameter Let us send you a descriptive folder giving more details including prices.

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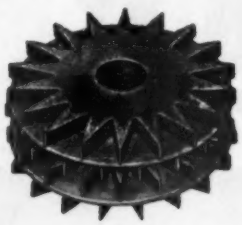

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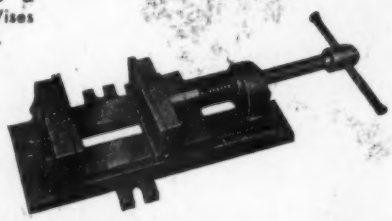

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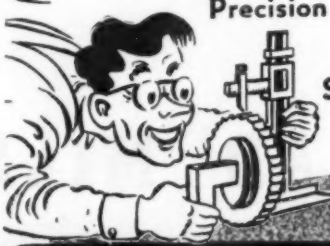

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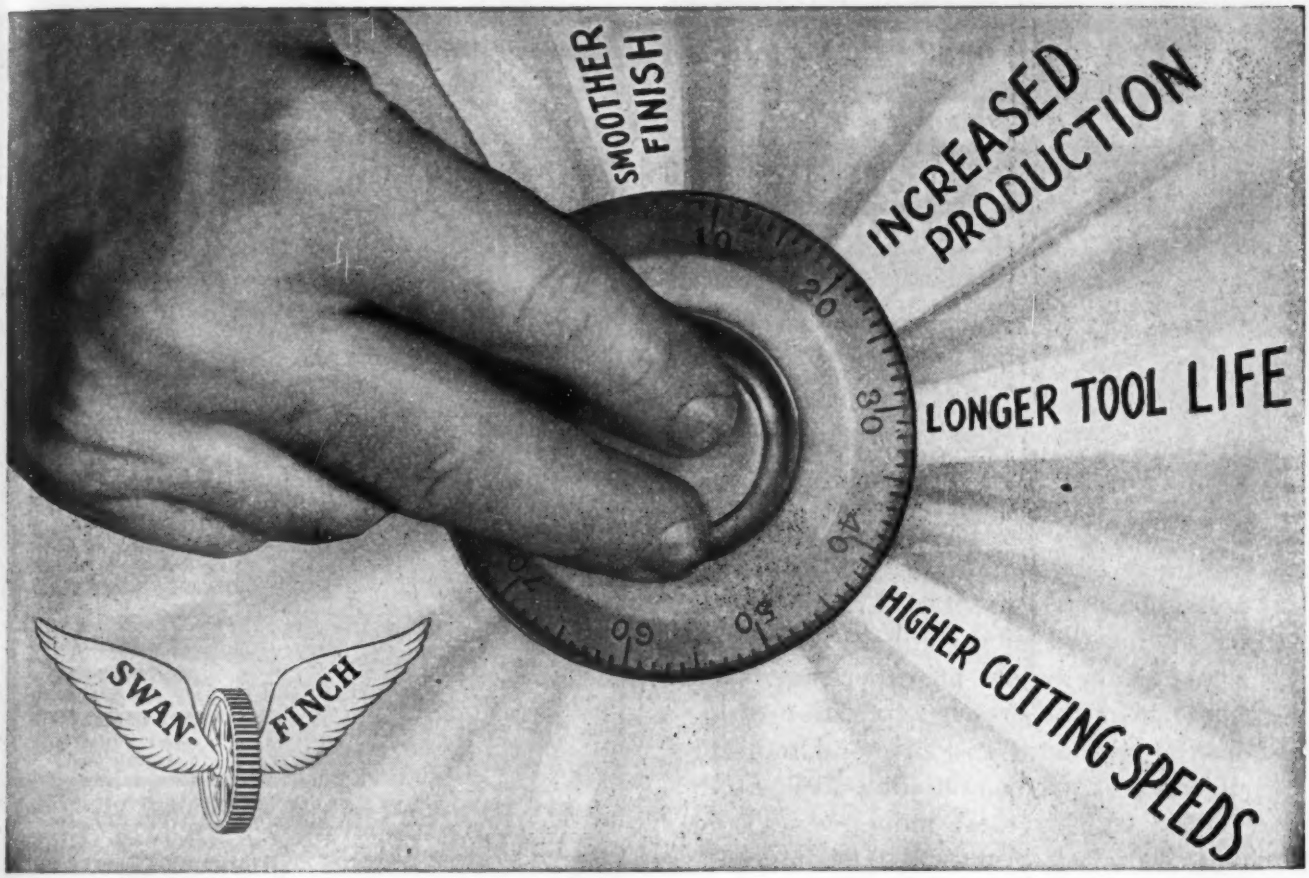

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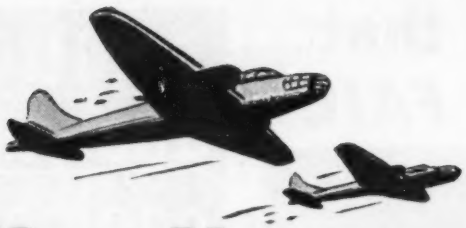

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to better, faster grinding of

National Emergency Steels-

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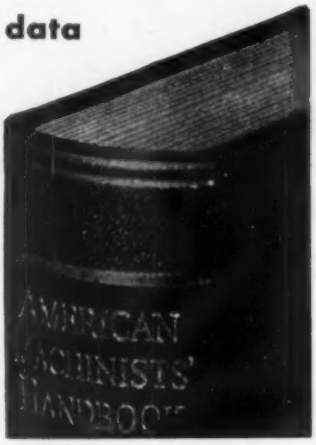

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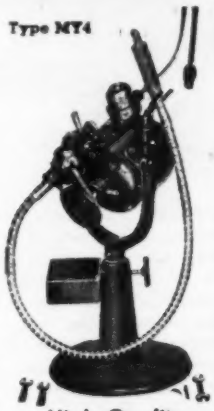

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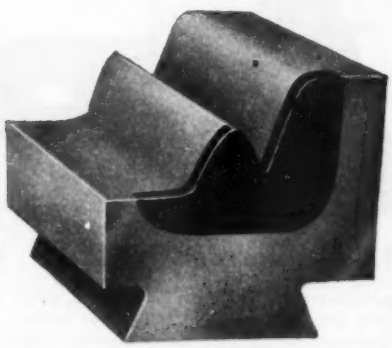

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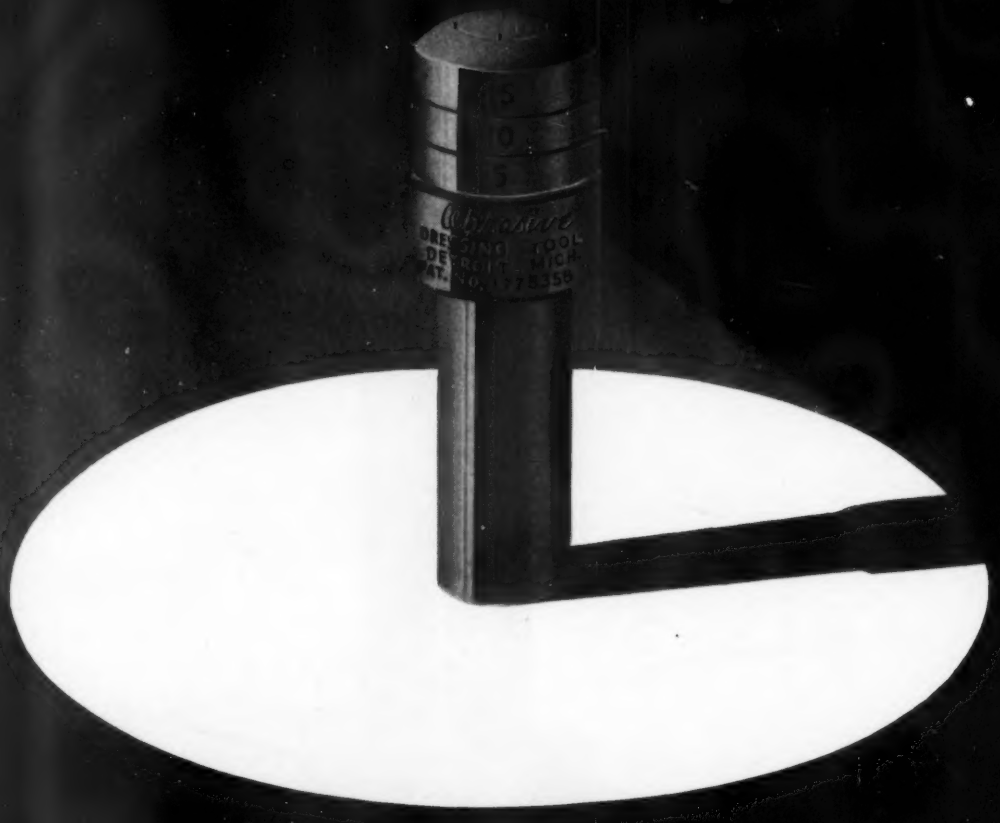

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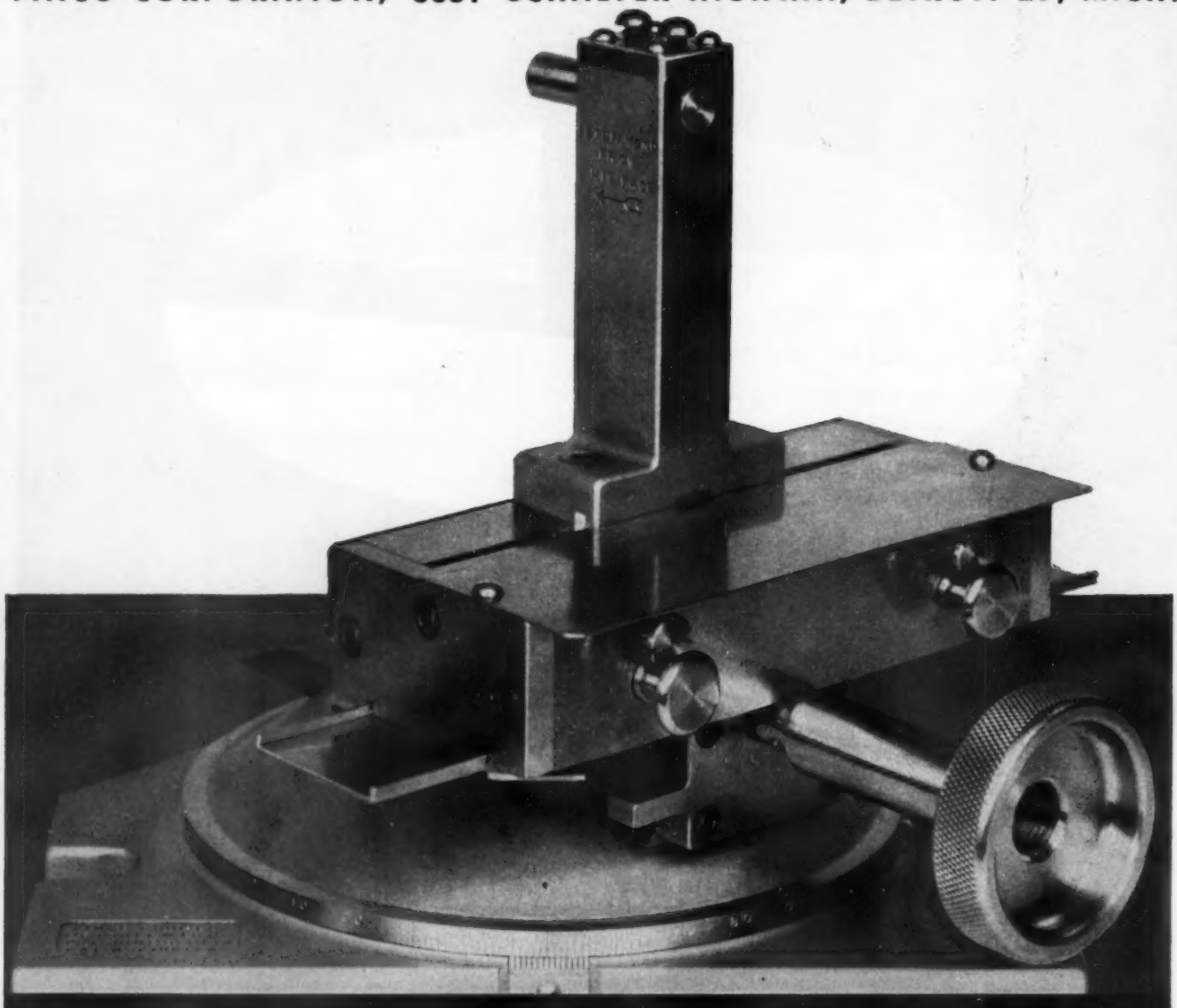

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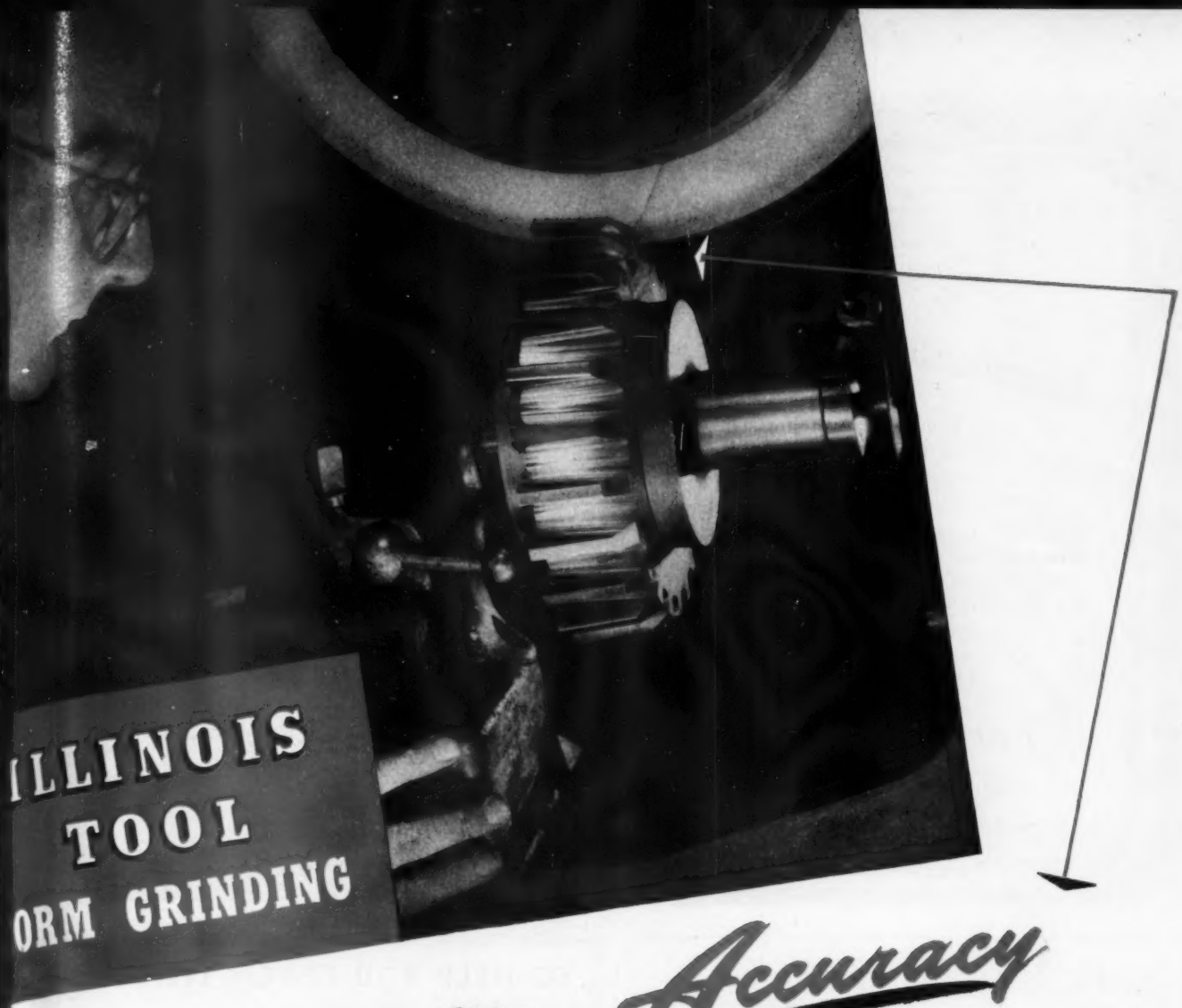

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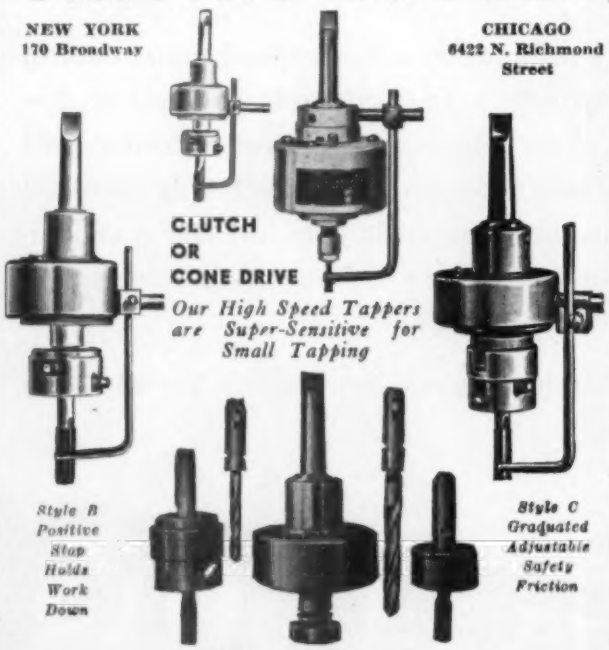

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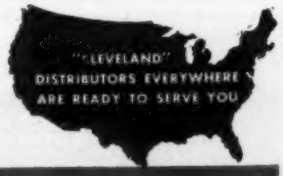

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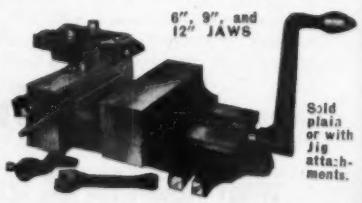

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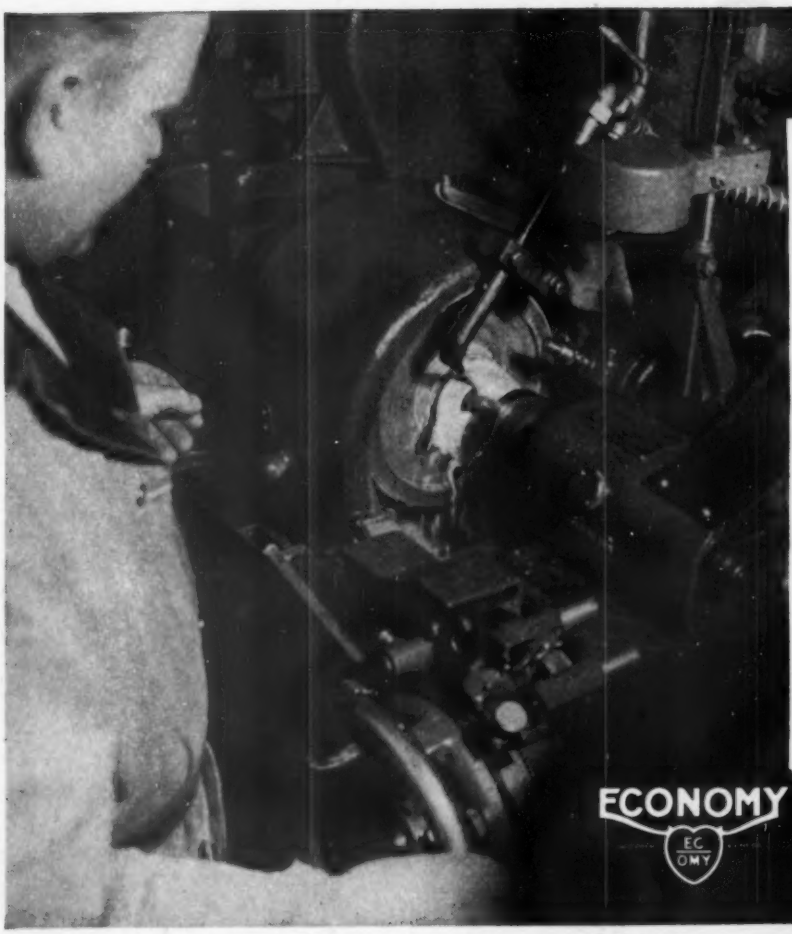

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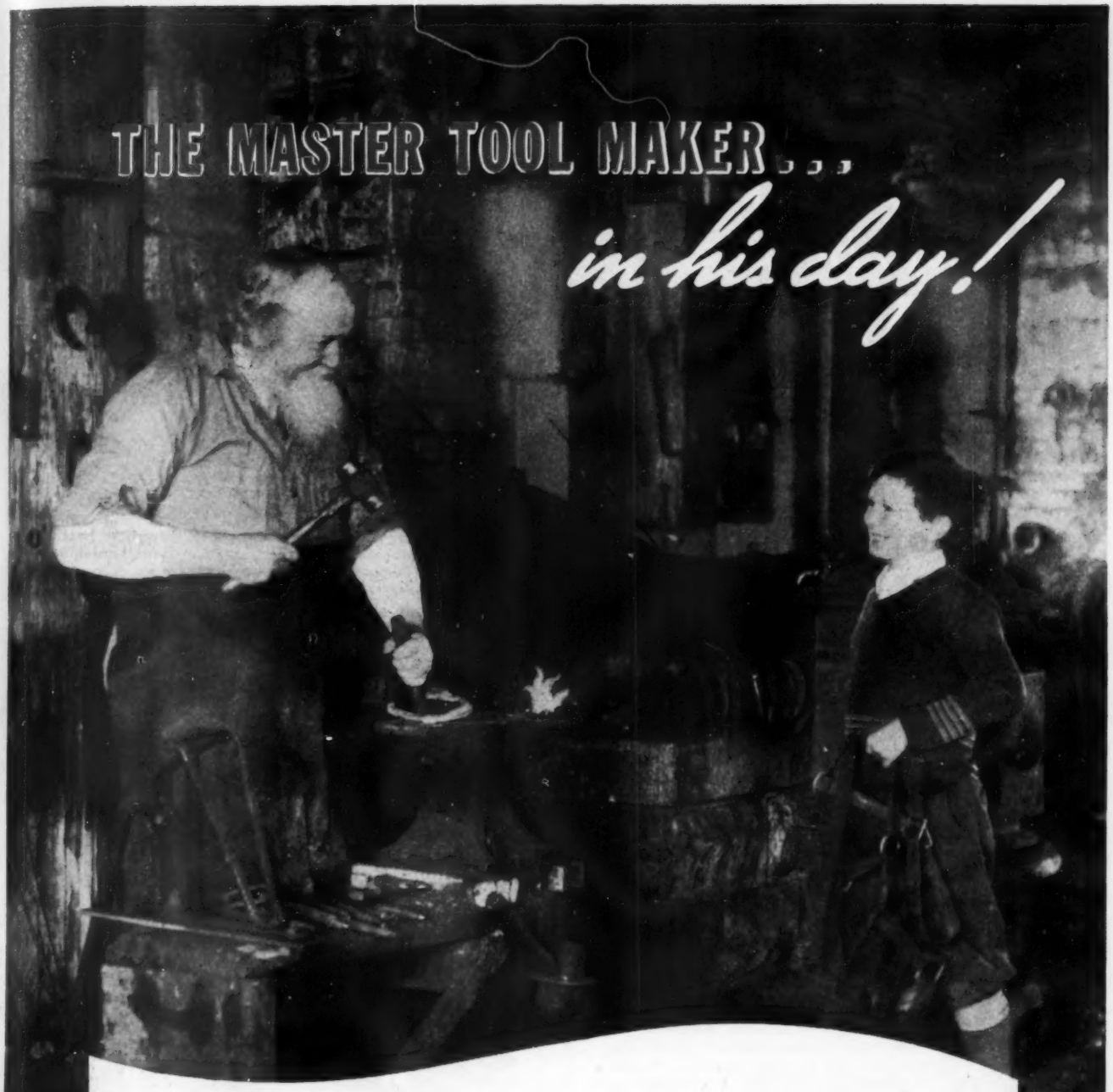

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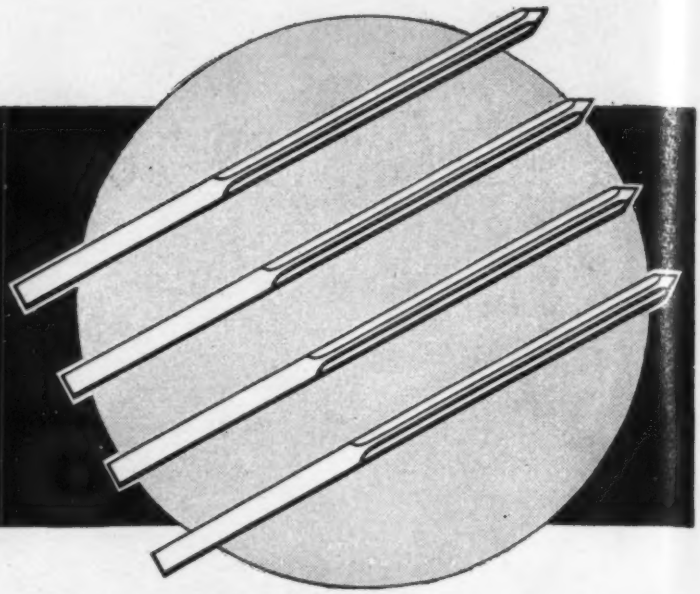

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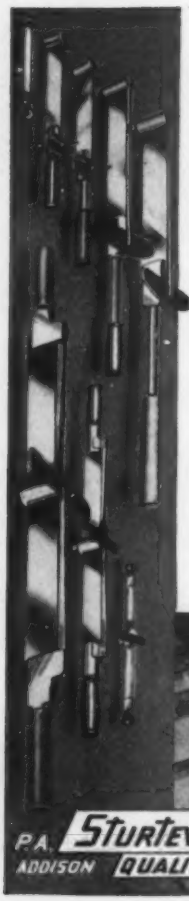

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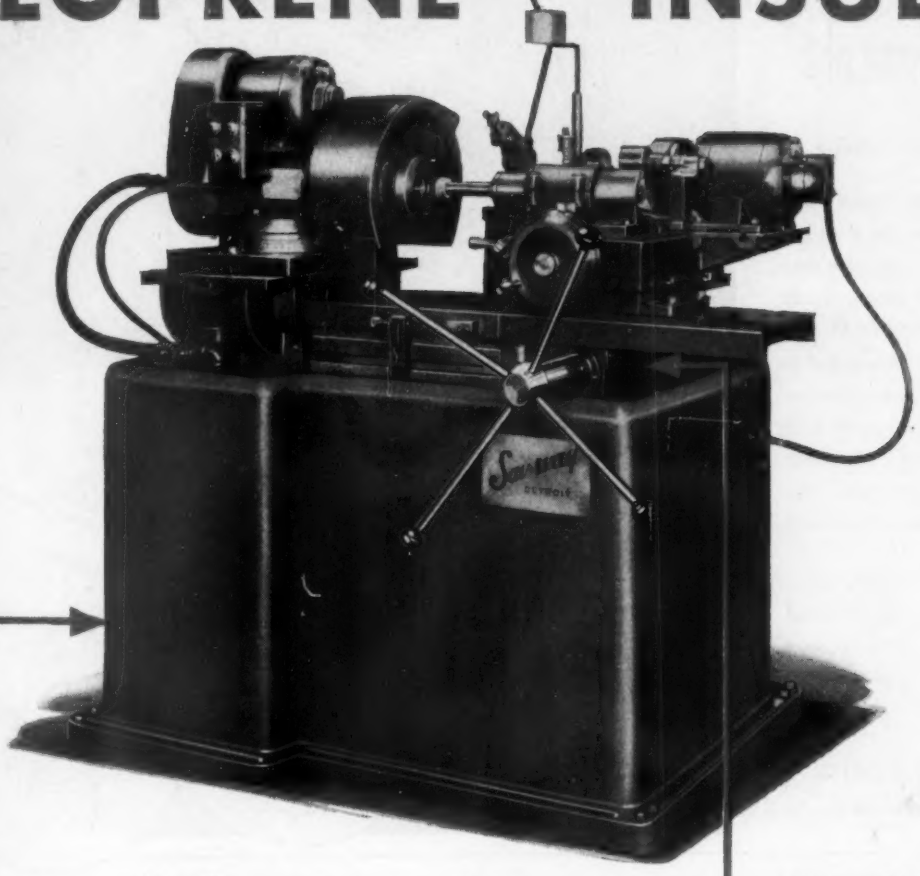


against Vibration, Distortion, Misalignment!

This radical departure from conventional design gives the Sav-Way multi-purpose internal grinder a new permanence of alignment and resulting higher accuracy. The bed proper is a thick surface-plate type normalized alloy iron casting of heavily ribbed whale-back construction. Neoprene pads between the bed and the steel base eliminate metal-to-metal contact and absorb floor vibration, preventing distortion of the base being transmitted to the bed, which is accurately scraped. This is only one of seventeen specific features which make the new Sav-Way M-1-A Grinder outstanding in design and construction.

For complete description and specifications, attach the coupon to your letterhead.

Send the Coupon for Your Copy

KEEP AN EYE ON

Sav-way INDUSTRIES

Machine Tool Division

4875 EAST EIGHT MILE · DETROIT, MICHIGAN

MAKERS OF SAV-WAY HAND AND HYDRAULIC INTERNAL GRINDERS · SAV-WAY GOLD

SAV-WAY INDUSTRIES, 4875 E. 8-Mile Road
Detroit, Michigan

Kindly send me a copy of the illustrated folder describing the Sav-Way M-1-A Internal Grinder.

Name_____

Position_____

Firm_____

Address_____

City_____ State_____

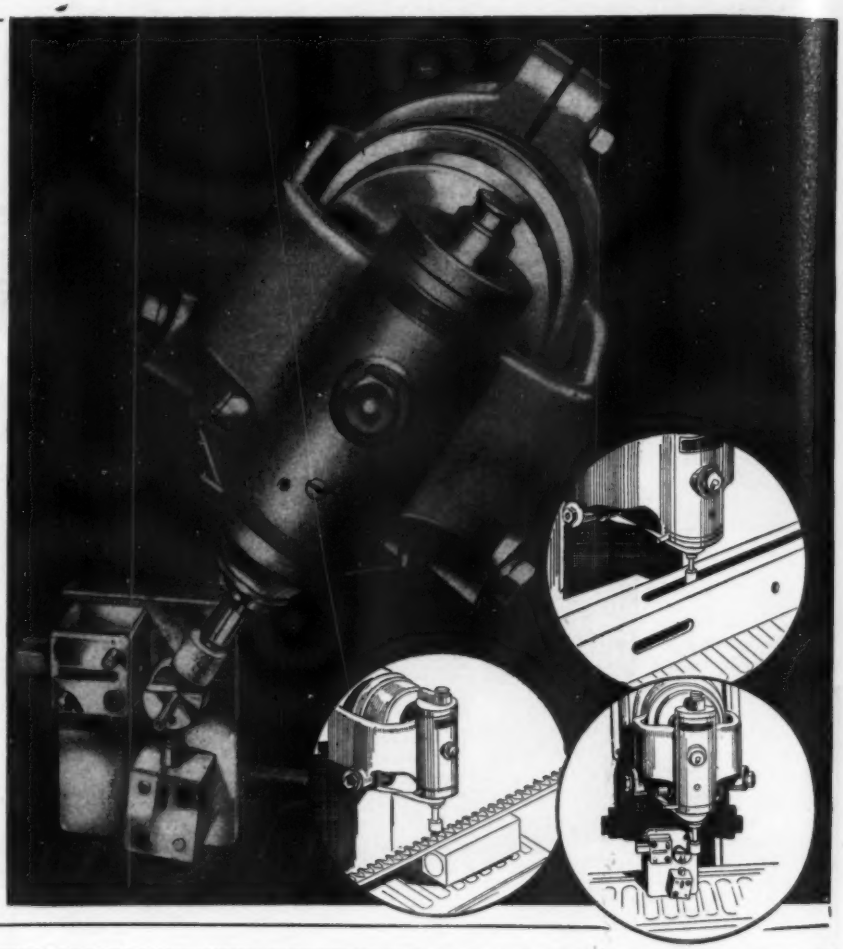
Liberty High Speed Attachments

FOR SURFACE GRINDERS

Liberty High speed Grinding Attachments are precision tools designed to meet difficult situations. They do not require floor space in already crowded shops. There are two models . . . HORIZONTAL and VERTICAL. Each may be assembled to many popular makes of surface grinders, converting them into high speed, ultra precision machines capable of handling a great variety of intricate jobs. Assembly time may not exceed two minutes.

From our own experience of many years, we know that Liberty High Speed Grinding Attachments will multiply the productive capacity of surface grinders . . . economically.

LIBERTY TOOL & GAGE WORKS, Inc.
241 Georgia Ave. Providence, R. I.



GRAND QUIKCET

4 second clamping!

FASTER PRODUCTION! BETTER HOLDING! QUICKER, ONE-HAND SETTING. This NEW clamp gives you 4 second clamping and increased holding power on either *flat or beveled surfaces without shifting.*

Operates with ratchet rod instead of turn screw with powerful fulcrum tightening on the side.

Integral spring snaps clamp on work ready for instant adjustment of ratchet rod and final tightening.

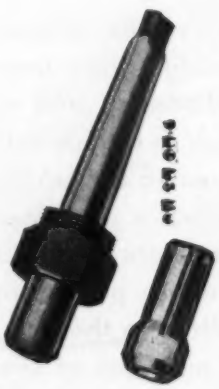
A. Spring activated pawl for ratchet.
B. Replaceable swivel.
C. Case hardened casting contacts vise-like tightening screw with fulcrum action.
D. Provides downward pressure on work.

See your jobber at once or write direct about procurement of these clamps for faster work in your shop and on the production line.

GRAND SPECIALTIES CO.
3100 West Grand Avenue • Chicago, Illinois

New • MODELS
• EFFICIENCY
• DESIGNS

ERICKSON
PRECISION
COLLET CHUCKS



The ERICKSON COLLET

This chuck, famous throughout industry, now available in a complete range of sizes and shanks. Adaptable for use on all types of production equipment. Send for particulars.

SEND FOR BULLETIN "D 1"

ERICKSON STEEL CO.
2309 HAMILTON AVE. CLEVELAND, OHIO

DBL High Speed Steel HAS SET RECORDS . . . NOW HERE'S *Super DBL!*

DEVELOPED ESPECIALLY FOR YOUR HEAVY-CUT FAST-FEED, HARD AND *Tough Jobs!*

THIS is the next step in Allegheny Ludlum metallurgical development of the DBL low-tungsten molybdenum analysis. *Super DBL* is the DBL analysis with the addition of cobalt, and it develops the maximum red hardness—the same *extra margin* of cutting quality—that you were formerly accustomed to get in a tungsten cobalt steel as compared to 18-4-1.

Super DBL has been thoroughly tested and proved. In performance, as well as in the conservation of vital alloys, it meets the needs of the times. You'll find it an ideal selection for heavy duty tools—especially suited for roughing or hogging work on hard, gritty materials, such as cast iron and steel; or on tough materials like heat treated alloy and stainless steels. There is nothing special in its heat treating or handling requirements. • Available *now*—in standard forms and finishes, and in mill-treated toolholder bits—from Allegheny Ludlum and distributor's warehouse stocks, coast to coast.

Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

A-9073 . . . W & D

Knock-Out DRILL CHUCKS

KEYLESS SELF-ENERGIZING

● ALL Drill Chucks hold drills. But THERE IS A DIFFERENCE! K-O Chucks are built with specially heat treated, floating jaws which are your insurance for absolute accuracy and your guarantee against drill shank chewing. A twist of the finger tips is all that is necessary to tighten and hold the drill. From then on K-O Chucks tighten themselves. Another twist of the finger tips and the drill is released.

Made in five sizes to accommodate drills ranging in size from 0—7/8".

K-O Chucks at Work on the Drill Presses

Write for Bulletin DC-43-AM

KNOCK-OUT

K. O. LEE CO.

Aberdeen, South Dakota

Because the screw machine industry is of such tremendous importance in this modern war age in the production of the materiel to help bring peace as quickly as possible, it behooves each and every operator to see to it that his tool holders are so designed that they will lengthen tool life and obtain the maximum of production perfection.

Faster set-up, the elimination of all bushings, uninterrupted production, and adjustable, compensating concentricity are features provided by *all* ALCO TOOLS. On old machines with worn spindles, these features help overcome imperfections in work produced. On new machines, they form an unbeatable combination of production efficiency.

THE TAP HOLDER SHOWN ABOVE IS JUST ONE OF THE FAMILY OF ALCO TOOL HOLDERS FOR ALL DRILLING, TAPPING AND THREAD CUTTING OPERATIONS ON SCREW MACHINES. WRITE FOR COMPLETE CATALOG.

★

ALCO TOOLS

THE ALCO TOOL CO., 253 Birdseye St., Bridgeport, Conn. Detroit Office—908 Stephenson Bldg.

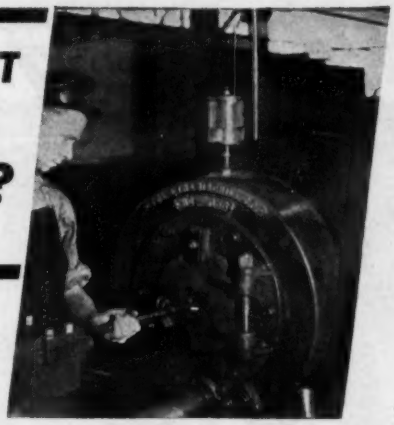
DOES YOUR SHARE in the WAR EFFORT INVOLVE

TAPERING, SIZING or REDUCING?

If so

IT WILL PAY YOU TO INVESTIGATE

ETNA SWAGING MACHINES



WHAT IS SWAGING? ETNA Swaging Machines draw round solids or tubing down on a taper by a process of forging or hammering with revolving dies. Note particularly that material is *drawn* or reduced. This means that no metal is cut away . . . thus effecting savings in material and machining costs.

IS SWAGING ACCURATE? Yes. Parts handled on ETNA Swaging Machines can be held within limits of two to three thousandths of an inch in diameter . . . and parts can be produced in volume quantities on ETNA automatic or semi-automatic feed machines.

WHAT MATERIALS CAN BE SUITABLY SWAGED? Most Swaged parts are of round bar stock or tubing, but multiple sided stock can be handled. Previously formed blocks can be Swaged easily. ETNA Swaging Machines are widely used in shaping tubular housings and in the completion of small tubular assemblies.

Important too is the versatility of ETNA Swaging Machines. When present emergency conditions are past ETNA units can easily be applied to normal peacetime operations.

Write today . . . your request will bring complete information on ETNA Swaging Machines.

• *Above are three examples of the varied jobs ETNA Swaging Machines are doing today. Top-knurling, tapering, and sizing army cot legs. Center-Swaging copper bands on 20 mm. shells. Bottom-Tube pointing, prior to drawing.*

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

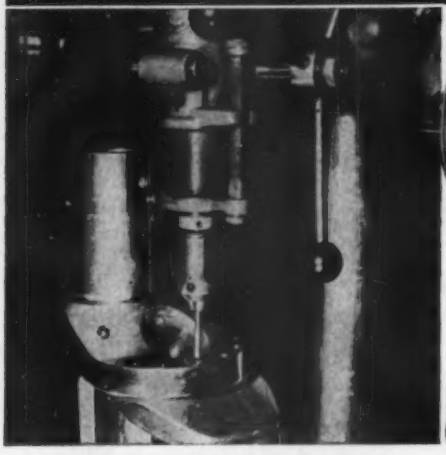
"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY

TOLEDO . . . OHIO

"HARDSTEEL" DRILLS

PAT'D



Save 6 Hours Time

. . . Removing Broken Tap from Wright Crankshaft!

In the plant of one manufacturer of Wright crankshafts, "HARDSTEEL" drills are saving time and giving 100% parts recovery when taps break in blind holes.

FORMER PRACTICE

Grinding out tap with pencil grinder—time 8 to 8½ hours—frequent loss of the part when grinder defaced threads.

PRESENT PRACTICE

Drill about ⅛ inch into tap with a "HARDSTEEL" drill—enlarge hole by grinding—drill again—grind and continue until tap is cut out. Time 2 to 2½ hours—no loss of parts.

This is just one of hundreds of applications where the ability of "HARDSTEEL" drills to drill, ream, countersink and counterbore steels hardened by any process pays big dividends.

Ask for a copy of the "HARDSTEEL" Operators Manual—24 pages of practical information that will prove the value of "HARDSTEEL" tools in any service shop. Free on request.

HARDSTEEL DRILLS

BLACK DRILL CO. • 5005 Euclid Ave., Cleveland, Ohio

"You Harden It... We'll Drill It"

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

Here's the

"KNOW-HOW" of GUN MANUFACTURE

. . . available as reprints from *American Machinist* ARMAMENT SECTIONS

● Requests are still being received for the $1 volume on "Gun Manufacture". SORRY, BUT THIS IS NOW OUT OF PRINT. We do, however, have a limited supply of most of the Armament Sections from which the gun book was compiled. Check the list below and send for any sections you may want. Please include stamps, check or money order with your request.

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PRICE **15c** EACH

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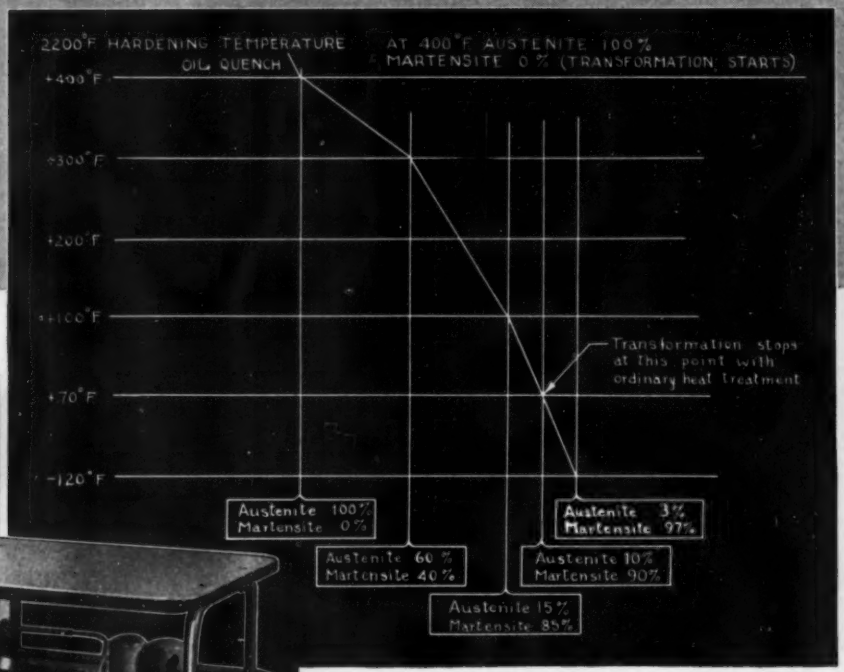
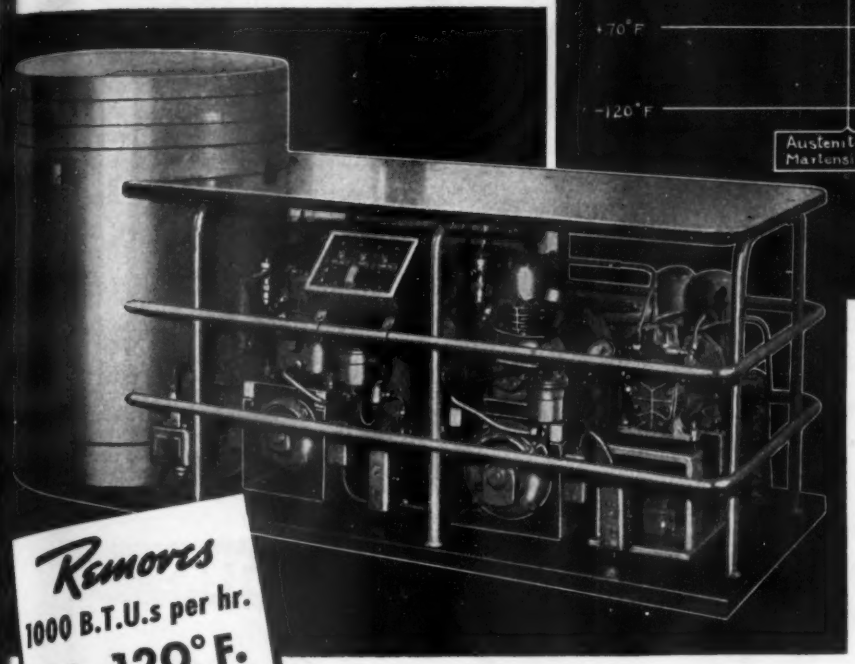
AMERICAN MACHINIST

330 W. 42 St., New York, N.Y.

How Cold Treatment of Steel at -120°F. Results in Transformation of Austenite to Martensite

Provides Extra Hardness and Toughness...Relieves Stresses and Strains...Produces Uniformity of Hardness





Removes 1000 B.T.U.s per hr. at -120° F.

The above chart was developed by a prominent metallurgist showing the curve of transformation of Austenite to Martensite in metal at temperatures varying from 400° F. to −120° F.

● The Deepfreeze Cascade −120° F. Industrial Chilling Machine is finding widespread application in the hardening and stabilization of metals by cold treating at temperatures of −100° F. to −120° F. It has been found that the proper cold treatment will produce a uniformity of hardness that clearly indicates that most stresses and strains have been relieved.

The treatment of metals by the chilling method is as yet too new to understand its full possibilities, but recent tests reveal that chilling of steel at −120° F. in a Deepfreeze immediately after quenching results in a greater transformation of the retained Austenite to Martensite. With ordinary heat treatment the transformation stops when the steel reaches room temperature, leaving approximately 10% Austenite content. However, chilling to −120° F. in a Deepfreeze results in a nearly complete decomposition of the retained Austenite.

Deepfreeze Cascade -120° F. Industrial Chilling Machine for the Shrinking, Testing and Treating of Metals . . .

In addition to the treatment of metals, Deepfreeze Chilling Machines are finding many other money saving applications in a wide variety of industrial fields. The Cascade −120° F. Industrial Chilling Machine shown above has the chilling capacity for high production metal chilling of any part where large quantities of heat must be removed fast. It is adaptable to almost any metal chilling job. Let Deepfreeze engineers assist you in the application of cold treatment to your products.

Example Procedures in the Treatment of Steel by Deepfreeze Chilling Method

REX M.M. HIGH SPEED TOOL STEEL

Heat Treatment (Ordinarily Used)	Heat Treatment (Deepfreeze Method)
Pre-heat.....1550° F.	Pre-heat.....1550° F.
Hi-heat.....2160° F.	Hi-heat.....2160° F.
Quench.....(air)	Quench (air) to +120° F.
Draw.....1025° F. (2 hours)	Deepfreeze to −120° F. (3 hours)
	Warm to atmosphere in air
	Draw.....1025° F. (2 hours)
Cool to room temperature	Cool to.....+120° F.
Draw.....1025° F. (2 hours)	Deepfreeze to −120° F. (3 hours)
	Warm to atmosphere in air
	Draw.....1025° F. (2 hours)
	Cool to.....+120° F.
	Deepfreeze to −120° F. (3 hours)
Rockwell Showed 63-64 C.	*Rockwell Showed 65-67 C.*

NOTE: If the Draw is permitted to go over 1025° F. it will be necessary to repeat the Deepfreeze chilling process.

WATER HARDENED DIE STEEL—The following method is that found best adapted for cold treating water hardened die steel.

1—Heat to 1500° F. (or usual method).
2—Quench at 75° F. (or usual method).
3—Immerse at once into Deepfreeze at −120° F.
4—Draw as usual (if drawing temperature exceeds 875° F. then again immerse in Deepfreeze at −120° F.)

FINISHED PRODUCTS—For the cold treatment of finished products not manufactured by the user, the following procedure is successfully used by many firms with Deepfreeze equipment.

1—Heat to 300° F. in tempering furnace (if furnace is not available use boiling water at 212° F.)
2—Cool to atmosphere.
3—Immerse in Deepfreeze at −120° F.
4—Warm to atmosphere.
5—Repeat cycle 5 to 6 times.

Free Additional Information

For additional information on Deepfreeze equipment send for free copy of bulletin with complete details, specifications, and listing other uses.

Deepfreeze

2327 DAVIS STREET
NORTH CHICAGO, ILLINOIS

...idal Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan

MILFORD profile saw

The blade for all contour and profile band saw machines

NOW BETTER THAN EVER!

You can now bank on more production than ever from your contour and band saw machines . . . when you use improved MILFORD PROFILE SAW blade to do the cutting.

A new automatically controlled method of heat treatment guarantees the uniform depth of hardness of every foot of PROFILE SAW. This accurate control of the depth of hardness of each tooth is tested by "etching" sample pieces of each saw. It's an exclusive new process . . . another contribution of specialists with over sixty-five years of experience in metal band saw manufacturing.

ORDER FROM YOUR MILL SUPPLY DISTRIBUTOR

Have you adapted your band saw machines to Profile Sawing? If not, write us for directions and a free sample. Include specifications of your machines and the cutting jobs you would like to do on them.

THE HENRY G. THOMPSON & SON COMPANY
NEW HAVEN, CONNECTICUT
Also makers of MILFORD REZISTOR HACKSAW BLADES

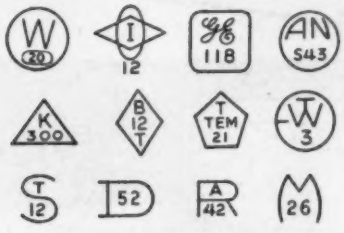
ANY DESIGN OR LETTERING

*Reproduced in "Safe-Hed"**

STEEL STAMPS

REG. U. S. PAT. OFF.

Matthews skilled craftsmen will accurately reproduce your trade mark . . . symbol . . . monogram . . . special lettering or design in sturdy built, "Safe-Hed" Steel Stamps . . . for inspection marking of your products or work identification stamping. Here are a few typical examples:



Write for Bulletin A-1

This valuable bulletin illustrates hundreds of stock symbols, and ideas for special designs for inspection or work identification stamping. Write for your free copy today.

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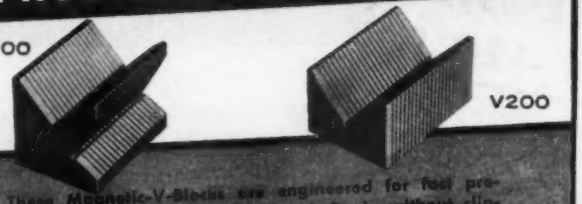
PRODUCTION BOOSTERS



These Magnetic-V-Blocks are engineered for fast precision production. Holds your work firmly without slipping. Helps increase operation efficiency. Soon pays big dividends on your investment. Write today for descriptive circular.

FRANK McMAHON CO.
142 SOUTH JUNE STREET DAYTON, 3 OHIO

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(Reg. Trade Mark)

Letters and Figures

Deeper, clean impressions. Will not spall, will not mushroom. Any size character from 1/32" up.

Immediate delivery.

Write for data!

M.E. CUNNINGHAM CO.
SAFETY STEEL STAMPS
95 E. Carson St., Pittsburgh, Pa.

Don't Let INJURY Ambush Your Screw Driving Army

PHILLIPS SCREWS ARE SKID-PROOF!

Neither inexperience nor carelessness are hazards where workers drive Phillips Recessed Head Screws. Lost-time accidents, caused by slipping screw drivers, are eliminated. The scientifically engineered Phillips Recess prevents skidding!

With the *automatic centering of driving force* by the Phillips Recess, there are no fumbling, wobbly starts... slant-driven screws... burred and broken screws heads. And, freed from these former handicaps, your screw driving army develops speed and perfection. Even raw recruits make a good showing, with Phillips Screws. In most cases, power driving can replace slower hand driving.

They cost less to use! Compare the cost of driving Phillips with that of slotted head screws. You'll find that the price of screws is a minor item in your total fastening expense... that it actually costs less to have the many advantages of the Phillips Recess!

KEY TO FASTENING SPEED AND ECONOMY

The Phillips Recessed Head was scientifically engineered to afford:

Fast Starting – Driver point automatically centers in the recess ... fits snugly. Screw and driver "become one unit." Fumbling, wobbly starts are eliminated.

Faster Driving – Spiral and power driving are made practical. Driver won't slip out of recess to injure workers or spoil material. (Average time saving is 50%.)

Easier Driving – Turning power is fully utilized by automatic centering of driver in screw head. Workers maintain speed without tiring.

Better Fastenings – Screws are set-up uniformly tight, without burring or breaking heads. A stronger, neater job results.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

21 SOURCES

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The Bristol Co., Waterbury, Conn.
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International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
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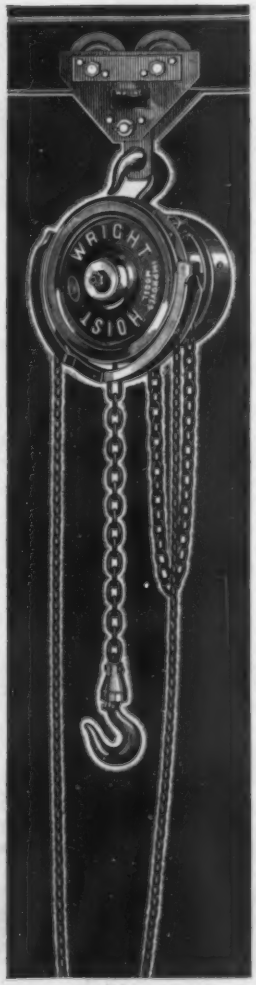
WRIGHT
Improved High Speed
HOISTS

WATCH LOAD HOOK!



WRIGHT HOISTS are built to carry more than their rated capacities, but like other well-made pieces of mechanical equipment they should *not* be overloaded. Overloading is dangerous to men and imposes excessive strain on the hoist. Certainly, this is no time to take chances with either men or machines.

Watch the load hook. Wright load hooks are drop-forged from special steel which, when subjected to overloading, give visible warning by opening slowly. When the load hook has started to open, look to the top hook too, for while it is stronger than the bottom hook, it also may be reaching a danger point. When hooks show the effect of overloading, replace them immediately with new ones. Remember: repair parts are both easier and cheaper to get than a complete new hoist.

Send today for a free Crane Signal Chart. This chart (36″ x 24″) illustrates the various crane signals—and the use of the Wright system of crane signals will speed crane operation and promote safety. Write for your chart today.

WRIGHT MANUFACTURING DIVISION
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York
AMERICAN CHAIN & CABLE COMPANY, INC.
BRIDGEPORT, CONNECTICUT

In Business for Your Safety

ARMY E NAVY
FLYING OVER THE WRIGHT HOIST PLANT

Why Not Buy the Original Electric Etcher?
MARK IRON and STEEL
THE Etchograph WAY
3000 IN USE

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.
Three sizes to meet all requirements.

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Hanna Cylinders
Dependable power for pushing, pulling or lifting. Standard models, air or hydraulic, low or high pressure, for all requirements. Write for full details.
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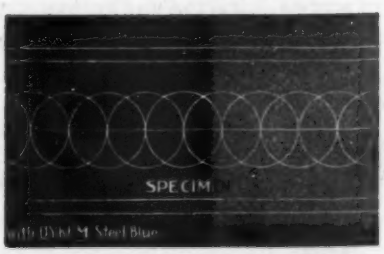
HOLMAN *BETTER, FASTER HOLE FINISHING*

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates



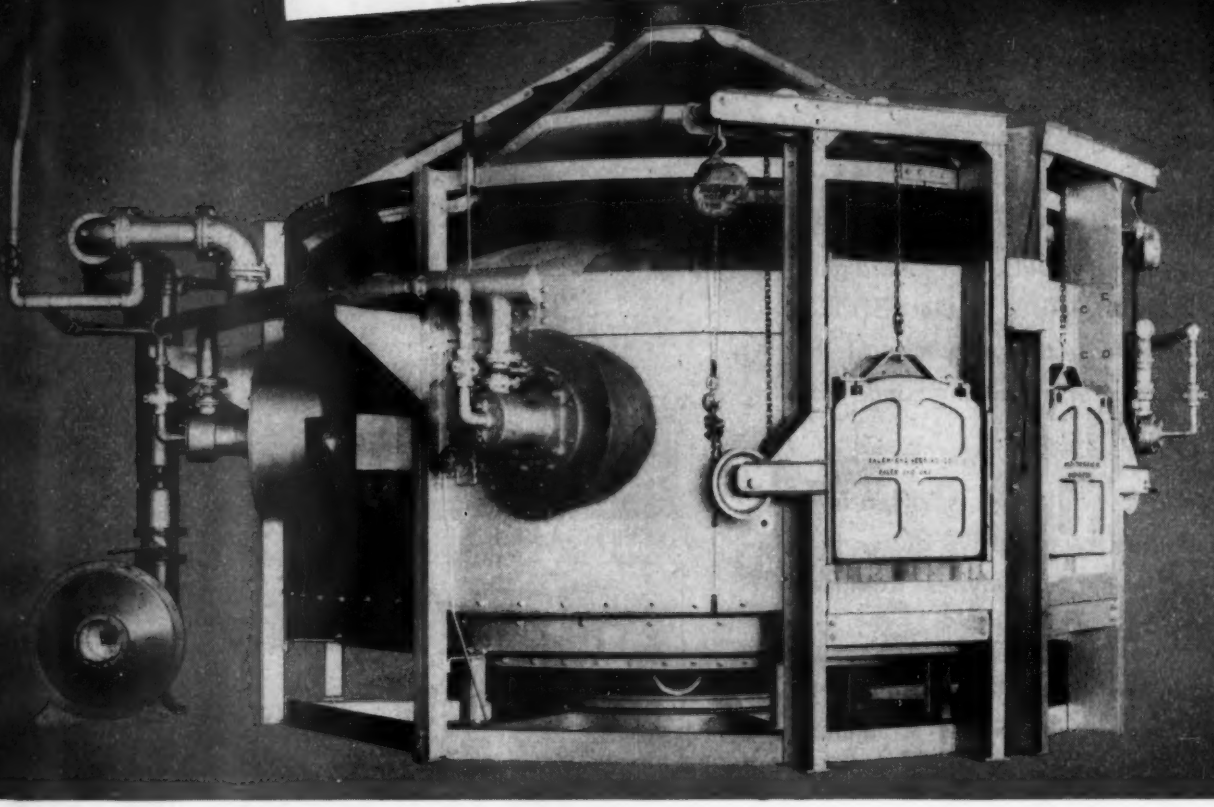
simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B N 11th Street, St. Louis, Mo.
In Canada: 444 Pacific Ave., Toronto, Ont.

INGENIOUSLY DESIGNED SALEM FURNACES HELP YOU

....SPEED PRODUCTION
....OBTAIN MAXIMUM UNIFORMITY
....REDUCE COSTS
....PREPARE for PEACETIME OPERATIONS



Every Salem furnace has its own special features which are applied to individual production requirements. Rotary Hearth Furnaces, for instance, are standardized by many manufacturers, but Salem furnaces are tailor-made—no "off-the-shelf" plans are used. Furthermore, by installing special features such as handling mechanisms, etc., furnace operations are coordinated with your production lines. An example of Salem's versatility in designing—the largest rotary hearth furnace in the world for heating steel carries the Salem trademark. • Salem Rotary Hearth Furnaces are ruggedly constructed; they give maximum heat treating uniformity, conserve fuel, have ingenious hearth movement, and permit big production from smaller floor space. Let Salem engineers help you to solve your present war production problem with a furnace that will also be valuable to your peacetime operations. And Salem has the ingenuity and experience to do it.

SALEM ENGINEERING COMPANY

SALEM ENGINEERING CO. · SALEM, OHIO

OF DUST HAZARDS..

Don't allow dust to *air raid* your plant, menacing employees' health and efficiency, and destroying your valuable machinery. Sound the "All Clear" by installing TORIT Self-Contained, Portable DUST COLLECTORS. They trap dust instantly at the source, economically and efficiently.

NOTE: Silicosis is oftentimes caused by abrasive dusts. Protect your employees from this hazard.

Inquire further about the advantages of Torit Dust Collectors.

TORIT
MANUFACTURING CO.
280 WALNUT STREET
SAINT PAUL, MINNESOTA

★

DON'T LET UP AMERICA!

PRODUCTION AND MORE PRODUCTION IN '43.

TORIT Dust Collectors
SELF-CONTAINED UNITS

You may get used to dust and grit, but your lungs don't. Ask a veteran and he'll tell you that abrasive particles filling the air from unprotected buffing and grinding wheels are his No. 1 Health Hazard.

Glasses will protect their eyes, ordinary caution will keep their fingers clear of whirring wheels. But it takes the Cincinnati Air Master, filtering up to 930 cubic feet of air per minute, to eliminate harmful dust and grit from the air your workmen breathe.

Write yourself a policy for pure air insurance with the purchase of Cincinnati Air Masters for grinding and buffing wheels. Easily installed, easily cleaned, they're built in three sizes to fit all grinders and buffers.

Write for full information.

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The Cincinnati Electrical Tool Co
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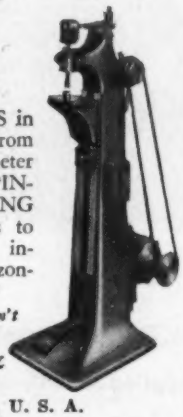
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to $\frac{5}{8}$" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

TORNADO WRITING TOOLS and ETCHERS

Protect Valuable Tools!

TORNADO Electric Writing Tool. Used for marking everything. Easily portable anywhere.

TORNADO Electric Writing Tools and Etchers mark everything of value that might be lost, misplaced or stolen. TORNADO Writing Tool marks brass, marble, tile, glass, plastics, wood, hard rubber, aluminum, steel and bronze.

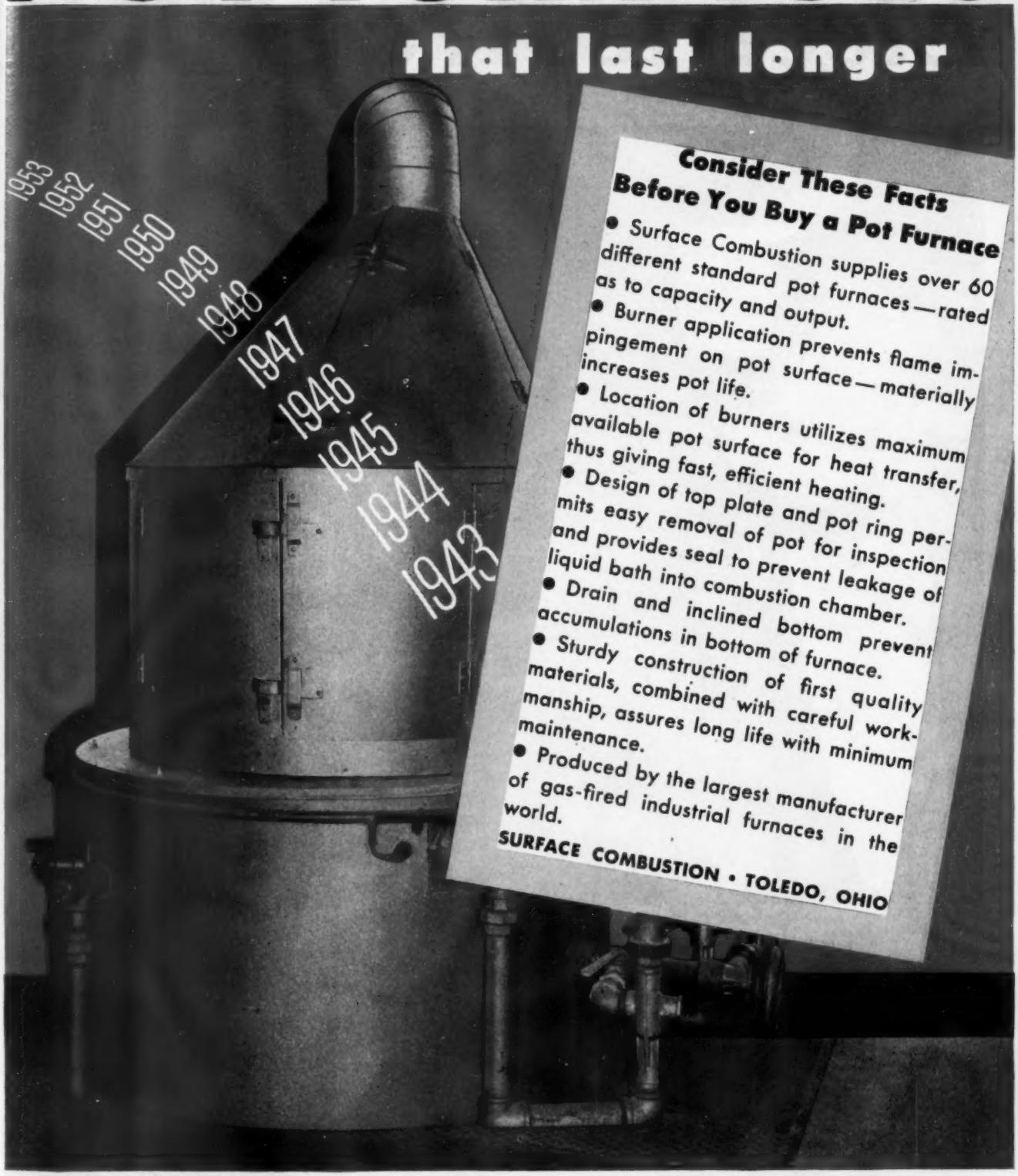
TORNADO Electric Etcher marks iron, steel and steel alloy products. Burns permanent identification on various types of tools, dies, gauges, plates, gears, etc. Protects your valuable tools and other portable equipment!

WRITE FOR COMPLETE DETAILS

BREUER ELECTRIC MFG. CO.
5084 N. Ravenswood Ave., Chicago

POT FURNACES

that last longer



Consider These Facts Before You Buy a Pot Furnace

- Surface Combustion supplies over 60 different standard pot furnaces—rated as to capacity and output.
- Burner application prevents flame impingement on pot surface—materially increases pot life.
- Location of burners utilizes maximum available pot surface for heat transfer, thus giving fast, efficient heating.
- Design of top plate and pot ring permits easy removal of pot for inspection and provides seal to prevent leakage of liquid bath into combustion chamber.
- Drain and inclined bottom prevent accumulations in bottom of furnace.
- Sturdy construction of first quality materials, combined with careful workmanship, assures long life with minimum maintenance.
- Produced by the largest manufacturer of gas-fired industrial furnaces in the world.

SURFACE COMBUSTION • TOLEDO, OHIO

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES • JANITROL GAS-FIRED SPACE HEATING EQUIPMENT • AND KATHABAR SYSTEMS FOR DRY BLAST

The Electric Arc STUD

★

Automatic Stud Welder in operation. Studs furnished from 1/8" to 7/16" in diameter and from 1" to 8" in length.

★

End-welded stud and plate cut in half, showing complete fusion of plate and stud. (Welded area etched and polished to show dense structure of the weld.)

NELSON SPECIALTY WELDING EQUIPMENT

Nelson WELDER

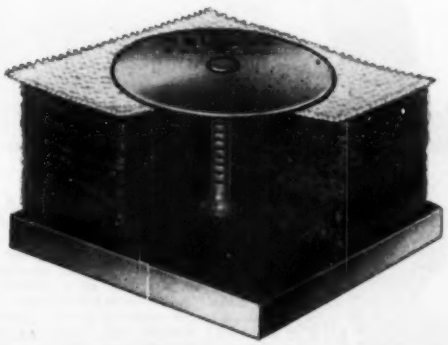
Save 75% of your time and material cost. Studs automatically end-welded in one-quarter of one second.

STUD USES

1. Securing wood decking.
2. Securing hangers for wireways; single, double, and multiple runs.
3. Securing hangers for pipe.
4. Securing plastic armor.
5. Securing plastic decking.
6. Securing all types of insulation material.
7. Securing wood furring strips.
8. Securing electric light fixtures and switch boxes.
9. Securing gun mounts.
10. Securing man hole covers.
11. Securing furniture.
12. Securing cargo battens.
13. Securing degaussing trough covers.
14. Drawing outer hull to template form.
15. Drawing steel plate to conform to shape.
16. Securing doubler plates.
17. Securing treadplates.
18. Spacing outer shell on uptakes.
19. Reinforcing concrete.
20. Securing chain to buoys.
21. Securing canvas weather stripping.

Now used in 120 major shipyards in the United States and Canada.

Wire for samples, catalog, price list, etc.



1½" head pointed Nelson insulation pin, end-welded through insulation material, with cut-out section to show method.

NT CORPORATION, SAN LEANDRO, CALIFORNIA

"SET-UP"
Your Machinery
ANYWHERE .. with Empco JACKS

Time can be saved — and space too — because with these new self aligning EMPCO Jacks you can set up your machinery anywhere without first locating a level spot. Periodical re-leveling time is saved too, because EMPCO Jacks' quick two-way adjustment feature gives accurate results in a few moments. The Jacks are precision made and have only 3 working parts: upper and lower castings and adjusting screw. The fitted castings permit sufficient "float" for "self alignment. If you want to eliminate guess-work in setting up your machinery it will pay you to write for all the facts about EMPCO Jacks today! Prompt deliveries are made from stock.

SEND FOR FOLDER TODAY

PROMPT DELIVERY
Deliveries made from stock.

EMPCO
THE ENTERPRISE MACHINE PARTS CORPORATION
2711 JEROME AVE. DETROIT, MICH.

BUZZER INDUSTRIAL Gas EQUIPMENT
*Reg. U.S. Pat. Off.

No Blower or Power is needed to reach High Temperatures with a "BUZZER" Gas Furnace . . . just connect to your gas supply.

Rectangular Heat Baths

For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

BUZZER Rectangular Heat Baths meet the increasing demands for large liquid Heat Bath Furnaces, and are built in many sizes. Also made in round type pot furnaces

Send for the new BUZZER Catalog showing full line of Gas Furnaces, Burners and other equipment.

Full Muffle Furnace (Bench Type)

CHARLES A. HONES, INC.
121 South Grand Avenue Baldwin, L. I., N. Y.

ACROMARK
THE ACROMARK CO. ELIZABETH NEW JERSEY

Remelt and Cast Your Lead Hammers with the Field Mould and Ladle

Save time and money—keep lead hammers in good condition at all times—easy to use—fast. Made in 7 sizes for hammers from 1 to 11 lbs. Write for details.
Also, Lead Hammers, sizes 1 to 15 lbs. always in stock.

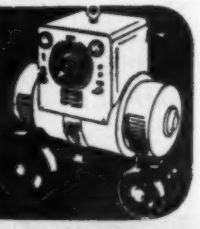
JOHNSON TOOL CO., INC.
East Providence Rhode Island, U.S.A.

For Greater Output, use...

Features like balanced design, end-to-center cooling, 4-pole exciter, straight or reverse polarity at the flip of a switch, dual control for 1,000 "heat" combinations and Remote Control . . . all make Hobart a giant at its work.
HOBART BROS. CO., Box AM-916, TROY, O.

HOBART... One of the World's Largest Builders of Arc Welders

HOBART
ARC WELDERS
Free Catalog sent on request



Why American Airlines ordered another Ozalid Machine

SALESMAN'S REPORT

Date August 13, 1943

Salesman J. A. Travis

Company American Airlines, Inc.

Address LaGuardia Airport, City, N.Y.

Interviewed Mr. P. Hayes, Engineering Dept.
Mr. Marvin Whitlock, Asst. Chief Eng.

The proof of the pudding lies in the eating. AMERICAN AIRLINES wants another machine — a faster model which will handle all of their reproduction work. They've had a Model F six months now and it's a "hit" with their Engineering Department and the men in the shop. In the future, print production will be 100% Ozalid White-prints — no blueprints.

1. Some of the things they like about Ozalid are:

A. A single operator can handle large-volume production.

B. There are no chemical baths, driers, or plumbing connections. Consequently, an Ozalid machine is compact... and may be installed in any corner of the drafting room.

2. C. You can make prints having blue, black, or maroon lines on a white background in one continuous operation. These are easier to read and check than blueprints.

D. You can make duplicate originals in the same manner as standard prints — without Van Dyke difficulties. These may be substituted for valuable originals in subsequent print production...or they may be employed by the draftsmen to eliminate retracing when making design changes.

E. An Ozalid machine is a "servant" and not a "master"... In other words, once you start a blueprint machine you have to keep feeding your tracings or you will waste paper. With Ozalid, however, you don't have to keep pace with a paper roller. You can use sheets cut to the size of your originals and feed as the demand arises.

3. All-in-all they're using Ozalid to reproduce engineering drawings, weather charts, flight analyses, office forms, and isometric drawings. What's most important — they're saving time, labor, and materials.

Please quote delivery on Model B with AA-1 priority.

P.S. Some Ozalid users on the Production Front

1. Grumman Aircraft Engineering Corp.
2. Hazeltine Electronics Corp.
3. Republic Aviation Corporation
4. American District Telegraph Co.
5. Prudential Insurance Co. of America
6. International Telephone & Telegraph Corp.
7. Carl L. Norden, Inc.
8. Ingersoll-Rand Company
9. American Stove Company
10. Pan-American Airways System
11. Cramp Shipbuilding Co.

SEE FOR YOURSELF—SEND FOR CATALOG

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

JOHNSON CITY, N. Y. ★ OZALID IN CANADA — HUGHES OWENS CO., LTD., MONTREAL

Positive action of BARRETT TYPHOON CENTRIFUGAL WASHERS provides for quick, thorough parts cleansing

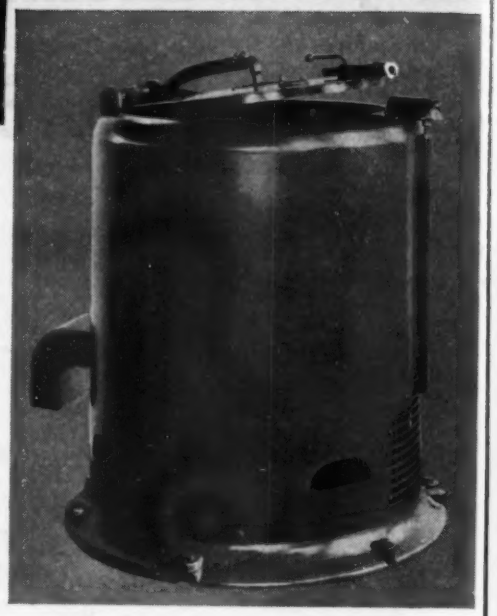
In these efficient centrifugal machines the washing solution enters the top of the whirling load under valve control. The operating principle—being that of a typhoon—gives the washing solution a spraying, swirling, and surging action which thoroughly permeates the contents. During this action, centrifugal force creates hydrostatic pressure within the basket. That proportion of the deluge going to the bottom is forced up the side and out carrying off the contaminated fluid.

A thorough, quick cleaning is definitely assured by flowing sequence. Two or more liquids may follow, making it possible to wash, rinse or provide any further treatment as required.

Several Barrett installations involve the use of four machines operated by one man who loads and unloads in three minute cycles. Washing time is only one minute. Another type of set-up provides for recovering oil, washing, drying, and coating with rust-proofing material.

As in all Barrett Centrifugal machines, provision is made for convenience and safety of operation.

Send at once for details of Barrett Typhoon Washer



Barrett Centrifugal Washer—made in capacities from 13 to 38 cu. ft. per hour. Each size, depending on condition, will perform at the rate of 20 duty cycles per hour.

THE LEON J. BARRETT CO., WORCESTER, MASS.

Designers and Builders of Centrifugal Machinery

FOR HEAT TREATING

275° F. — 1250° F.

IN THE SHOP

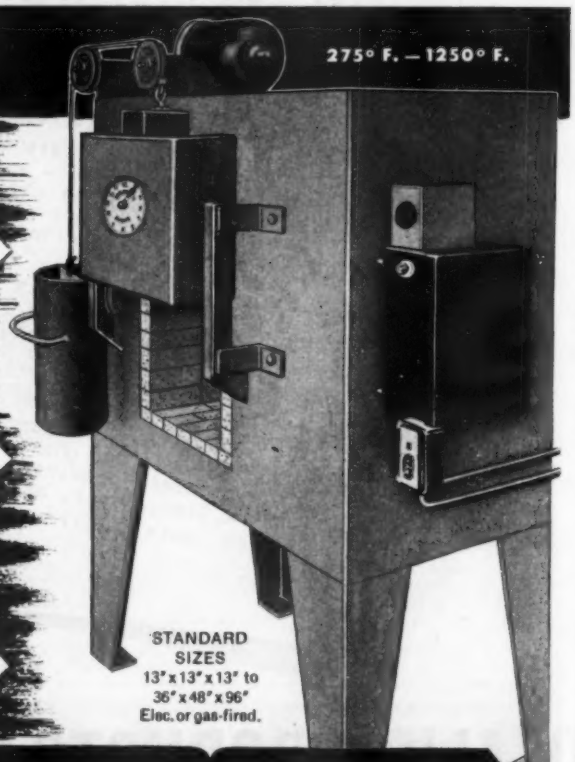
TOOLS, DIES & PARTS may be easily processed to correct Rockwell or Brinell every time. Improves quality. Very fast pre-heating, wide-range flexibility. For all heat-treating jobs in your shop.

IN THE PLANT

LARGE SCALE PRODUCTION is assured by high volume forced convection heating. Gives greater uniformity and control, faster heat penetration. Easily loaded, readily adaptable to any plant.

IN THE LABORATORY

METALLURGICAL TESTS may be made in less time and with greater accuracy. Supplies needed data promptly and may be used for the most exacting tests. Meets all requirements for research work.



STANDARD SIZES
13" x 13" x 13" to
36" x 48" x 96"
Elec. or gas-fired.

Free Bulletin 83 now ready. Ask for your copy today!

DESPATCH OVEN COMPANY MINNEAPOLIS

then I said to myself—

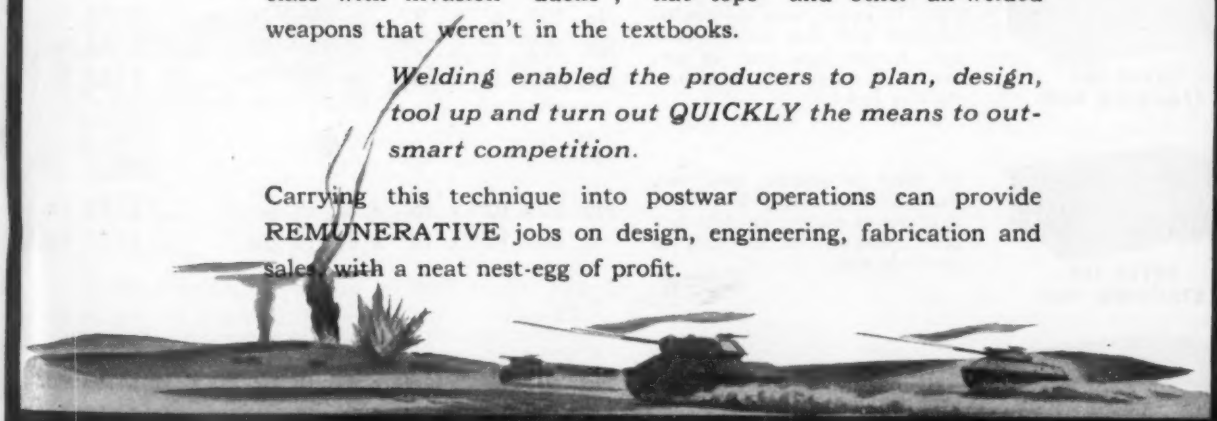
They've Deflated the German Mark VI

With fanfare of invincibility, the Mark VI tanks strutted out on the African sands. They're still there . . . with the accent on STILL.

American engineers gave our men the surprise weapon to do it . . . . . the all-welded M-10 tank buster—another cleaner-upper in the class with invasion "ducks", "flat tops" and other all-welded weapons that weren't in the textbooks.

Welding enabled the producers to plan, design, tool up and turn out QUICKLY the means to outsmart competition.

Carrying this technique into postwar operations can provide REMUNERATIVE jobs on design, engineering, fabrication and sales, with a neat nest-egg of profit.



THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

C-F POSITIONERS ... *Cut Welding Time · Reduce Welding Cost · Improve Welding Quality*

All sides, top and bottom, are welded downhand with one set-up. No waiting for the crane, no "handling" crew needed, for the welder himself rotates (360°) and tilts weldment (to 135° beyond horizontal) with a push button control. This "all-down," hand welding method permits use of larger rods, hence requires fewer passes and gives stronger, smoother, more uniformly flawless seams and joints.

C-F Positioners, pedestal mounted and adjustable for height, come in 6 capacities—from 1200 lbs. to 30,000 lbs. Manual, motorized or motorized variable speed operation.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1313 S. Kilbourn Ave., Chicago, U.S.A.

IMMEDIATE SHIPMENT

STEEL BOXES

FOR YOUR PRODUCTION NEEDS

STYLE 300 STACKING BOX

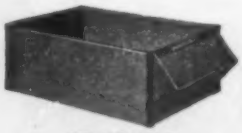
Just right for your small parts. Light in weight, easy to handle. Equipped with drop handles each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301	6" x 9"	x 3½"	20 ga.	$ .55 Ea.
No. 302	8" x 12"	x 4"	20 ga.	$ .60 Ea.
No. 303	9" x 13½"	x 4½"	19 ga.	$ .75 Ea.

STYLE 600 STACKING BOX

An ideal all-purpose shop box, Sturdy all-weld construction. Heavy skids act as positive stacking lock and re-inforce box at point of maximum wear.

No. 601	10" x 16" x 6"	18 ga.	$ .95 Ea.
No. 602	12" x 18" x 8"	16 ga.	$1.25 Ea.



STYLE 500 STACKING BOX

Open front makes contents easily accessible when boxes are stacked. Will stack with Style 600 boxes.

No. 501	10" x 16" x 6"	18 ga.	$1.15 Ea.
No. 502	12" x 18" x 8"	16 ga.	$1.50 Ea.

AMERICAN METAL WORKS, INC., 1509 Germantown Ave., PHILADELPHIA, PA.

MAYBE **Amesacks** CAN GIVE YOU ONE!

It wouldn't be the first time that these little time savers have added hours to somebody's work-day. They'll save up to 90% of packing and crating time, and up to 50% of postage and packaging cost, and they can be used within your plant to speed assembly work.

Write for **FREE SAMPLES**

★ ★ ★ JUST POP 'EM IN AND PULL THE STRING ★ ★ ★

AMES BAG COMPANY
1971 EAST 66TH ST. · CLEVELAND, OHIO

ERROR-PROOF COPIES *in a Jiffy*

Photo-exact copies for your office, shop, branch or distant plant are made fast and at low cost with A-PE-CO. One copy or a hundred in jig time — and A-PE-CO *can't* make mistakes. Copies directly from blueprints.

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AMERICAN PHOTOCOPY EQUIPMENT CO.
2849 N. Clark St. Dept. M-9 Chicago 14, Illinois

Announcing

THE CHANGE OF OUR NAME

to

DETREX CORPORATION

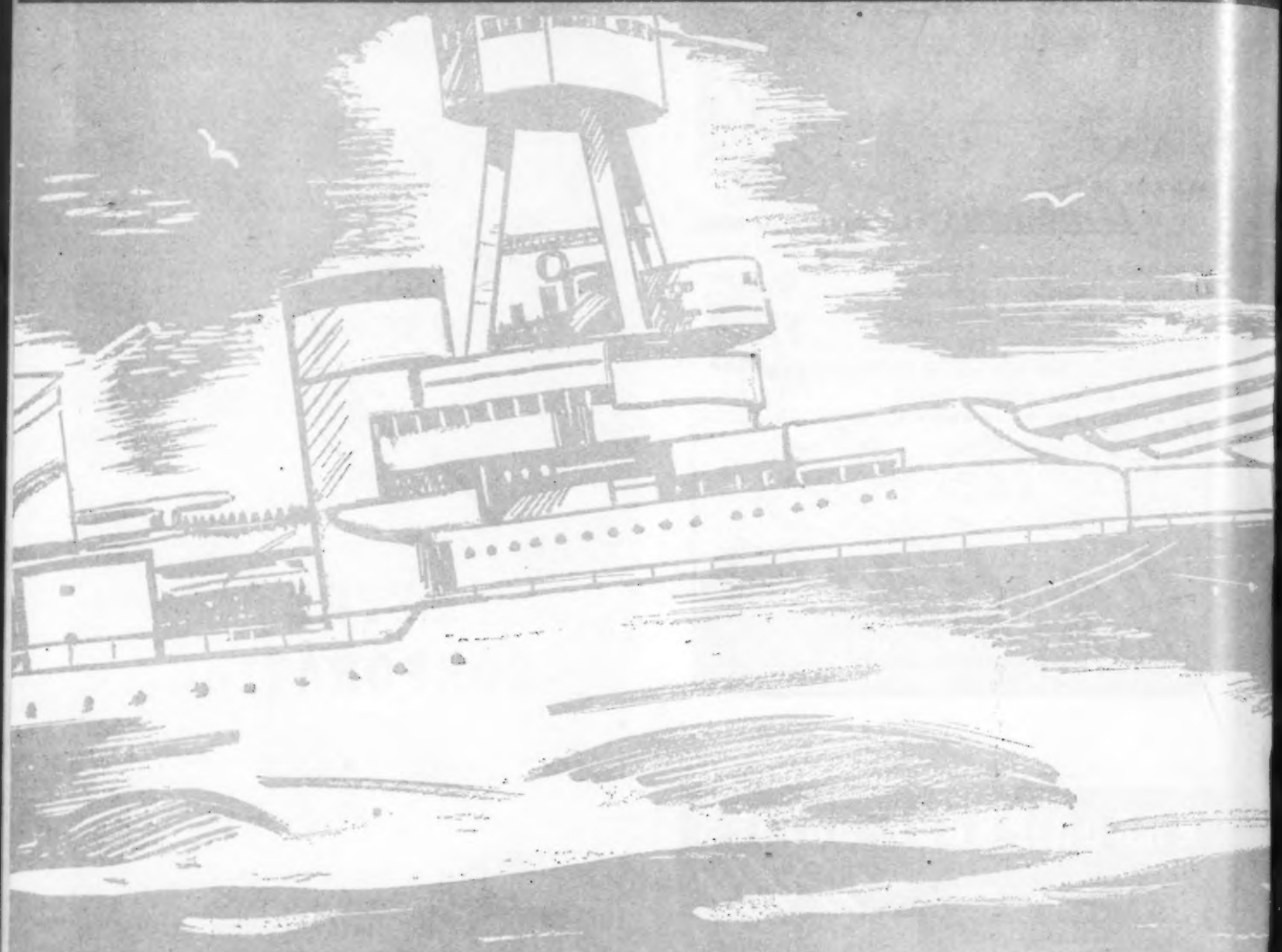
Over a period of many years the trade name "Detrex" has identified the products of this company. We feel that its adoption as our corporation name is singularly appropriate.

This change of name in no way affects the personnel, ownership, or policies of this organization.

DETROIT REX PRODUCTS COMPANY
DETROIT 27, MICHIGAN

Detrex manufactures: Degreasers using stabilized safety solvents, Perm-A-Clor and Triad... Washers for Alkali, Spirits and Emulsion Cleaning... Rust Proofing and Processing Machines... Triad Cleaning Compounds, Strippers, Emulsions, and Wet Spray Booth Materials ... Dry Cleaning Machines and Solvent Recovery Units... Oil Extraction Plants.

COLBURN ARMOR BOLT



TOUGH jobs like drilling and tapping 6" holes in heat-treated steel armor plate require tough machines like the 150-ton giant shown on the opposite page.

This Universal Drilling and Boring Machine was made by Consolidated espepecially for this type of work. It's a brute for strength—built to handle the toughest assignments and ask for more! A number of these machines are performing valiant service to our Victory program by greatly facilitating the manufacture of armor plate for battleship construction and for gun turrets.

Machine tools like this are typical of Consolidated skill and craftsmanship. If you have a special machine tool problem, we would be glad to work with you on its solution.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODER

CONSOLIDATE
MACHINE TOOL CORPORATIO
ROCHESTER, NEW YORK

DRILLING MACHINE!
COLBURN
COLBURN
COLBU

CONTRACT WORK

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Drill presses
DoAll contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922

CONTRACT WORK—

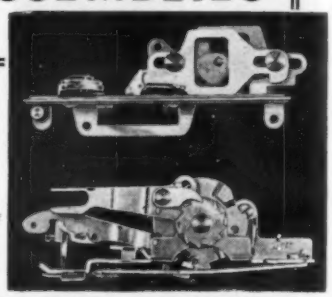
We can build machines and parts, special tools and fixtures of all kinds to your specifications and design. Skilled workmen and modern equipment are your guarantee of satisfaction. The design and building of wire and ribbon stock forming machines are our specialty.

We solicit your blueprints or samples for quotation. No obligation of course.

THE A. H. NILSON MACHINE COMPANY
Bridgeport, Conn.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

STAMPINGS AND ASSEMBLIES
"GREATER SAVINGS WITH GREIST"



We can make short or long runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. We are also fully equipped to make

SCREW MACHINE PRODUCTS
TOOLS, LIES, JIGS, FIXTURES

Quality work by skilled mechanics is assured. Send your blueprints or samples today"

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

AUTOMATIC SCREW MACHINES
Swiss Type
Contract facilities available for close tolerance Screw Machine parts.
½" Capacity.
Send Drawings or Samples for Quotations.
GILMAN ENGINEERING WORKS
214 N. First St., Janesville, Wis.

KIRK & BLUM
CONTRACT MANUFACTURING
ACCURATE SHEET STEEL
STAINLESS STEEL, MONEL OR
OTHER ALLOY FABRICATION
OUR SPECIALTY
CAPACITY ⅛" AND LIGHTER
THE KIRK & BLUM MFG. CO.
2823 SPRING GROVE AVE. CINCINNATI, OHIO

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8" x 8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO., HOCKESSIN, DELA.

AVAILABLE NOW
CYLINDRICAL GRINDING FACILITIES
Handle Stock to 4" x 13"
IMMEDIATE SERVICE
Let Us Quote You on Turning and Grinding
ACME EQUIPMENT CO.
W. C. Dept.
128 S. Clinton St. Chicago, Ill.

GEAR DESIGN
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ENGINEERING SERVICE
Specialists in
MASTER GEARS
HELICAL GEARS and
POWER TRANSMISSION
We Design, Process and Make.
Write: 2741 Book Bldg.
DETROIT, MICHIGAN

DESIGN & BUILD
JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
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PAWTUCKET, R. I.

CONTRACT FACILITIES
All types
MACHINE ENGRAVING and
MACHINE GRADUATING
Inquiries will receive our prompt attention
GILMAN ENGINEERING WORKS
214 N. First St., Janesville, Wis.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.
GENERAL PATTERN WORKS
2233 Burk Street Cincinnati, Ohio

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.
KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

WIRE AND METAL SPECIALISTS
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

Put Your Idle Capacity to Work
Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of **American Machinist**—about your facilities. Write for rates.
CONTRACT WORK DEPARTMENT
AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word minimum charge $2.00. (See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED—RATE PER INCH:

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., September 17th will appear in the issue of September 30th subject to limitations of space available

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense plant in Midwest; give experience and full particulars. P-593, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Midwest; give experience and full particulars. P-594, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

HELP WANTED—Young, or midde age, man, technical training preferred, capable of introducing speed and efficiency in medium size machine shop with large and small machine tools. Permanent position if you can produce results. P-638, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: Machine Designer—Experienced on the design of special machinery and machine tools. This is an excellent opportunity for a first class man interested in a steady position in New England. Only men 35-55 with a record of successful achievements will be considered. In replying furnish complete information preliminary to a conveniently arranged interview. P-645, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MAN WANTED: With machine tool experience necessary. Must be draft deferred. State technical qualifications. Require traveling. Essential industry. P-659, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

TOOL DESIGNER, married, age 37 with solid background as a machinist and experienced in Jig, Fixture and Plant equipment design, desires to locate with a progressive manufacturing company. PW-660, American Machinist, 330 W. 42nd St., New York 18, N. Y.

VICE PRESIDENT in charge of manufacturing seeks connection with firm having post-war program. Capable of assuming full responsibility of purchasing engineering and production of precision-devices machinery light and medium ordnance items. PW-661, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER, familiar with trench mortars, fuses, armor piercing projectiles, aviation bombs, special stream-lined projectiles, grenades for rifles and pistols, rocket projectiles, etc. desires connection with engineering offices, or a firm for developing of the above items. Box 5, 2110 West Venango St., Philadelphia, Pa.

Don't forget the

BOX NUMBER

When answering the classified advertisements in this magazine, don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

WANTED

PRODUCTION MACHINE SHOP

FOREMAN for post war work

Must have record of performance and be able to supervise the design and manufacture of tools and jigs. Handling of men essential. This company is now in war production having Army & Navy "E". Immediate employment could be arranged for right man. Good salary with future. Our peacetime product is sold nationally to one of this country's largest industries. The undersigned is acting as intermediary for the manufacturer, not an employment agency. Your name will not be turned over to prospective employer without your consent. There is no obligation on your part. Reply in detail to **GREER McILVAIN, 1341 Oliver Building, Pittsburgh, Pennsylvania.**

WANTED

MECHANICAL ENGINEER

Capable of acting as assistant to chief engineer in war plant making small precision electrical and mechanical devices. Must have long experience in tool design, processing and production methods. Availability certificate required. Apply in person or write stating age, education employment history.

PERSONNEL OFFICE

FEDERAL

Manufacturing & Engineering Corp.

199 Steuben Street, Brooklyn, N. Y.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives

Salesmen—Additional Lines

OFFERED

SALESMEN WANTED: Manufacturer of small cutting tools wants men of character and personality and knowledge of actual use of Drills, Reamers, Taps and Cutters. Prefers men between 25 and 35. Must be draft exempt. SW-662, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Ollwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

WANTED

WANTED—Deckel GK-2 Engraving Machine Milwaukee 1-H Plain Milling Machine Motor Driven Surface Grinder, 6 x 18. Write or wire: J. E. Hawley, W. Roosevelt, Phoenix, Ariz.

EXPORT ORDERS

Machine Tools, Small Tools, Factory Equipment, General Machinery, Machine Products. Manufacturer's Representative, twenty years selling experience in all countries. Last three years contacting all Foreign Buyers and Government Offices. Familiar with Contract Problems and Procurement Procedures. Will represent reputable manufacturers on Commission, Agency or Retainer Basis

RA-658, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POST WAR PRODUCT

Wanted for purchase or manufacture, by a completely equipped manufacturing plant, which has an excellent sales organization. Write us giving details of your product or item.

BO-627, American Machinist
330 West 42nd St., New York 18, N. Y.

Conserve Your Manpower

SELECTIVE SERVICE CONSULTANT will advise on manpower problems, preparation and submission of Replacement Schedules, Manning Tables.

SS-656, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

Layouts for Multiple Spindle SCREW MACHINES

Our Specialty

Designers and Builders of Automatic Labor-Saving Machines

Universal Machine Builders Co.

Empire State Bldg., New York, N. Y.

COMPLETE DIESEL ELECTRIC PLANT FOR SALE

One 60 H.P., 6 cylinder, Caterpillar Diesel with auxiliary starting engine.

One 37.5 KVA, 60 cycles, Star Electric Generator, equipped with Meter and Panel Board. Entire unit equipped with automatic safety devices and vibration isolators.

May be seen in operation Monday through Friday, 10 A.M. to 5 P. M.

Attention MR. LEVIN

L. & R. Metal Products 895 Broadway, N. Y. C.

LIVE CENTERS

Live Centers in Morse tapers from 1 to 5.

Large stock on hand

INDUSTRIAL MACHINE TOOL CO.

13 E. 13th Ave. Denver 1, Colo.

WANTED

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

WANTED

TURRET LATHE—Warner & Swasey preferred, late type, direct motor driven, in good used or rebuilt condition, to take 3 inch stock and swing 20 inch, complete with standard equipment, write with photo to **Room 961—1425 Dorchester St., West, Montreal, Que.**

THIS FOLDER GIVES ANSWERS TO PRODUCTION PROBLEMS

Send for Your Copy of This Folder Now

We have just finished printing an illustrated folder to show you why you can buy with confidence from The O'Brien Machinery Company • We've crammed it full of pictures that tell, better than words, that O'Brien is no "desk broker!" • We show you our plant, our warehouse, our rebuilding shops, the assembly and testing departments. • And there are many pictures of the types of machine tools and the power plant equipment that we rebuild, test and guarantee.

A copy of this folder will be sent you on request.

MACHINE TOOLS

DRILLS—4 spindle Leland Gifford B.B. Sensitive #2 taper, tapping attachment.
6 spindle Barnes 20", back geared, power feed.

GRINDERS—#6 Bryant Internal Grinder, 12" swing, b.d.
Wells Tool and Cutter Grinder. belt drive with equipment.

LATHES—20"x10' Bridgeport engine lathe, b.d., plain change.
19"x8' Sidney engine lathe, belt drive DBG, quick change.
28"x16' Fay & Scott, quick change, motorized.
24"x10' Advance, semi quick change, taper attachment.
19"x8' LeBlond, quick change, DBG.
18"x8' Reed Prentice, geared head, quick change, M.D.
14"x6' Davis, quick change, pan, motorized.
12"x6' Hendey, quick change, pan, tie bar.
12"x5' Cleveland, geared head, quick change, M.D.

MILLERS—

#3 Brown & Sharpe Plain Miller, belt drive but motorized, working surface of the table 12" x 42" quick change feed.

Steptoe plain, 30"x9" table, B.G., dividing heads.

SHAPERS—16" Gould & Eberhardt belt drive, with vise.
14" Steptoe single geared belt drive with vise.

AIR COMPRESSORS—1302 cu. ft. Ing. Rand XRB, 100 lb.
528 cu. ft. Chi. Pneu. N.S.B. 14 x 12, 100 lb.
254 cu. ft. Chi. Pneu. N.S.B. 10 x 10, 125 lb.
173 cu. ft. Penna. 3A, 9 x 8, 100 lb.

POWER PLANT EQUIPMENT

CENTRIFUGAL PUMPS

Gpm	Head	Size	Hp	Speed	Make
10	80'	1"	½	1800	Westco
50	49'	1½"	2	1800	Labour
35	350'	1½"	15	3450	Goulds
250	60'	3"	7.5	1800	DeLaval
300	150'	3"	25	1800	Goulds
300	60'	3"	5	1800	DeLaval
300	405'	4"	60	2300	Goulds
400	55'	4"	10	1800	Worthington
400(2)	460'	4"	100	1750	Dean-Hill
600	40'	5"	10	1800	Deming
700	40'	6"	10	1800	DeLaval
750	172'	5"	47	2300	Dayton-Dowd
1000	75'	5"	40	1800	Worthington
1000	106'	6"	50	1800	Delavergene
1200	322'	10"	125	1200	Dean-Hill
1200	60'	8"	30	1800	DeLaval
1500	40'	8"	30	1800	DeLaval
1500	33'	8"	30	1150	Worthington
1760	44'	8"	40	1800	Delaware
1800	360'	8"	200	1800	Worthington
1800(2)	125'	8"	75	1750	Cameron
2500	81'	10"	75	1800	Frederick
2500	120'	8"	125	1800	DeLaval
3500	350'	10"	150	1800	Earle
4850	85'	14"	60	1200	Dean-Hill
5000	160'	12"	200	1750	Worthington

Everything from a Pulley to a Power House

THE O'BRIEN MACHINERY CO.

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

113 NORTH THIRD STREET • PHILADELPHIA 6, PENNA.

BELL TELEPHONE: MARKET 4180 CABLE ADDRESS: O'BRIEN PHILA

IN STOCK!!!

LATHES

Putnam 30" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.
Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.

PRODUCTION LATHE

2—LeBlond No. 9 Automatic Lathes, capacity 9" swing, 16" between centers, geared head, arranged motor drive with motors for 3 phase, 60 cycle, 440 volt service. Equipment includes back facing attachment, oil pump and piping. New in 1929 and guaranteed in first class mechanical and operating condition. Special price for immediate sale.

TURRET LATHES

ACME 1½" cap., power feed to turret, screw cross slide, bar feed, 6 hole hexagon turret, collets, turret tooling, arranged M.D. 60-3-220/440 volt.
Foster 1" capacity Geared Friction Head, Hand Operated Turret and cross slide, collet, belt drive.
21" Gisholt Universal Turret Lathe with 3⅜" hole in spindle, 2-step cone for 5" belt.
Jones & Lamson 3 x 36 Double Spindle, air chuck equipment.
Jones & Lamson 3 x 36 Single Spindle, Geared Head, Single Pulley Drive.

FURNACE

1—W. S. Rockwell Revolving Annealing Furnace, Model 701.

BORING MILLS

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
30" Colburn Vertical Turret Mill, M.D.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.
1—Excello Boring Machine, Model No. D-B112-B.

GRINDERS

No. 6 Besley Double Opposed Disc Grinder.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Gorton, double end Disc Grinder, 18" discs.
Greenfield No. 12, Hydraulic Feed, motor drive; cap. swings 15", Grinds automatically ¾" to 5" di., 4" deep. New in 1928.

COILING MACHINES

No. 1 and No. 2 Sleeper & Hartley BX cable coil. mach., ⅜ and ½ in. cap. Last used for speedometer cable. Complete.

DRILLS

BAKER—#5 M.T.
Radial Drill 3' Beckford 9" Col, #4 Taper.

HAMMER

1—1100 lb. Bement & Miles Hammer.

DRILLING MACHINES

Fox No. 15H mult. spdl. drill. mach., Hyd. feed, 35 No. 1 Morse taper Spindles, 17" x 34" bd., ser. No. 1005, M.D., 10 H.P., 3 ph., 60 cy., 220 v.

Fox No. D31 mult. spindle drill. mach. Drilled for 32 spindles and equip. with 16 No. 2 Morse taper Pwr. fd., 17" x 34" bd. Ser. No. 626, m.d. 10 H.P., 3 ph., 60 cy., 220 v.

Nateo No. 12 mult. spindle drill. mach. Single pulley, B.D., Drilled for 16 Spindles and equip. with 6 No. 2 Morse taper. Power feed.

GEAR SHAPERS

2—#612 Fellows.

SHAPERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.

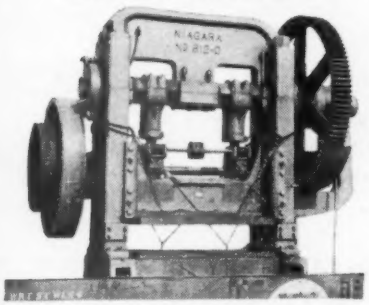
STRAIGHTENING MACHINE

No. 5-18½ Littell Single Rack & Pinion Feeding and Straightening Machine.

Presses, Brakes and Shears

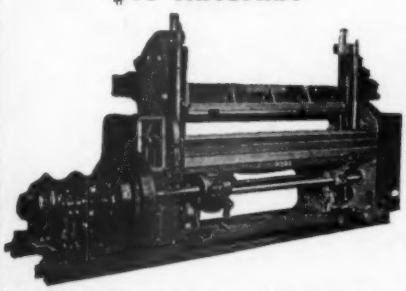
MARIETTA Power Press Brake 104" between uprights. Dual rams to permit operations on separate dies from both sides of press. Bed area 20" x 104", each ram 6¼" x 98". 4" crank shaft, 3" stroke. Excellent condition.
Ohl power square Shear 8' 10 gauge.
Kutscheid all steel 36" x 16 ga. Foot Shear.
No. 132 Bliss 14 ga. 18" throat Slitter.
No. 232 Bliss 12 ga. 18" throat slitter.
No. 306 Bliss Straight Side, Tie Rod, 8" stroke, air cushion, motor drive, Press.
No. 65 N Bliss Straight Side, Tie Rod, Geared, 125 ton, 6" stroke, air cushion, motor drive, Press.
No. 3½C Bliss Toggle Press, Tie Rod, Vee belt motors.
No. 3½C Bliss Toggle Press, Solid Frame, Vee belt Motor Drive.
No. 3 A Bliss Toggle Press, 5½" shaft, Vee belt Motor Drive.
#20 Bliss O.B.I. 2½" stroke.
Wickes Double End Punch & Shear, 48" thr., 1¼" x 1¼" capacity.

200 TON NIAGARA



1—Niagara #612 D press. Straight side, double crank, back geared, 200 ton cap., 3" stroke, bed 60 x 38.

#98 NIAGARA



HEAVY PRODUCTION FOLDER

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) 3/16" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

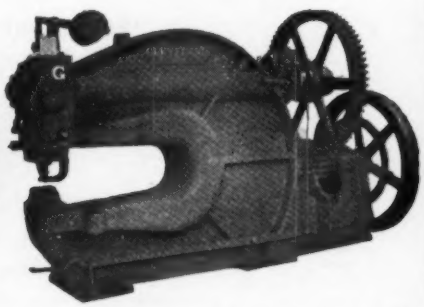
PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side head.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.

PROFILERS

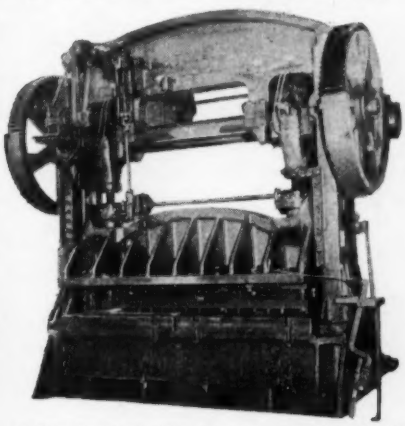
P & W. No. 12 2-spindle motorized Profiler, Table 12" x 15" equip. with 6" rais, blocks, and 5 H.P., 3 ph. 60 cycle, 220 V. motor—Turner drive mounted and wired to push button control—rebuilt and guaranteed.

MODEL G CLEVELAND GAP PUNCH



Vertical Cleveland, model G open Gap Punch, 52" throat, arch Jaw, 2" hole thru 1" plate cap. arrange for Gear motor drive. 10 H.P., 3 ph., 60 cy., 220 v.

Toledo 94½-J 200 Ton Press



TOLEDO 94½-P 200 ton press. Straight side tie rod, double twin, direct geared M.D. with 30 H.P. 3 ph. 60 cy. 440 V. motor & Con. Forced feed lub., pneumatic controlled friction clutch & brakes. Bed area—120" right to left x 50" front to back. 12" stroke, 18" sheet height. Bed equipped with spring cushions. Weight approx. 80,000 lbs.
Sanford No. 1½ Production Miller, Rotary Table.
Cleveland Vertical Miller No. 1 (New.)

Buy From Stock

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MACHINERY CO.,

18 WARD ST.

Tel. Main 6347

ROCHESTER 5, N.Y.

EASTERN OFFERS FROM STOCK

AUTOMATICS

2½" Cleveland Model A, m.d.
2⅝" Cleveland Model A, m.d.
4¼" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
4 spindle ⅞" Cleveland Model M, m.d.
2¼" Gridley Single Spindle, m.d.
3¼" Gridley Single Spindle, m.d.
No. 22 New Britain, with tapping spindle (3).
No. 33 New Britain, m.d., tapping spindle (2).
No. 6D Potter & Johnston, m.d., arranged for brake drum work.

HORIZONTAL BORING MILLS

4" bar Lucas Horizontal, m.d.
4" double spindle Barrett, m.d.
2¾" bar Sargent Floor Type, with floor plate 16' long by 4' wide.
No. 0 Fosdick Horizontal—3⅛" bar.
No. 31 Lucas Horizontal, m.d. 3⅛" bar (3).
3¼" Blomquist & Eck Horizontal.

VERTICAL BORING MILLS

42" Colburn, m.d., 2 swivel heads.
48" Cincinnati, 1 turret, 1 swivel head, m.d.
42" Niles Car Wheel Borer, facing attachment.
48" Niles Car Wheel Borer.
60" Baush, m.d., 2 swivel heads.

BROACHING MACHINES

No. 4 LaPointe Hydraulic, m.d., latest type Cincinnati Mill Broach, m.d., 10" spindle, brand new.
No. 2 LaPointe, belt.
No. 2 LaPointe of Hudson, belt.
No. 3 J.N. LaPointe Double, belt.

RADIAL DRILLS

12' American Triple Purpose, d.c., motor drive on arm, 26" column diameter, latest type.
6' Niles Semi-Universal, m.d.
6' Western, m.d.
5' Prentice, m.d., with Vari Drive.
5' Niles-Bement-Pond Full Universal, m.d.
5' American Triple Geared, gear box.
4' Niles-Bement-Pond Semi-Universal, m.d.
4' Cincinnati Bickford Plain, semi-inclosed head, m.d. (8).
3' Cincinnati Bickford Plain, semi-inclosed head, m.d. (5).
4' American Triple Purpose Plain, m.d. on base.
4' Hammond Jack Knife.
3' Fosdick Sensitive.
3' American Maxi-Speed Sensitive, m.d.
3' Carlton Sensitive.
2' American Triple Geared, gear box.

UPRIGHT DRILLS

No. 150 Baker Light Heavy Duty Quick Change, m.d., latest type, 1 year old.
21", 24" Cincinnati Bickford Upright, m.d.
24" Aurora
22" Barnes All Geared Self-Oiling.
24" Hoefer
24" Milwaukee.
30" Rich H.D., m.d., No. 5 taper.
36" Prentice.

HORIZONTAL DRILLS

No. 1 Pratt & Whitney 2 spindle Gun Barrel, m.d.
Pratt & Whitney Rifling Machine.
No. 00S Garvin Horizontal Duplex.
Love Bros. Horizontal, m.d.
Cincinnati Bickford Horizontal, m.d.
5 spindle Detroit Semi-Automatic.
6 spindle National Acme Horizontal.
8 spindle Hammond Horizontal.

MULTIPLE SPINDLE DRILLS

4 spindle Harrington No. 4 Taper.
No. 2 Baush, 38x21" rect. head, hydraulic feed.
No. 2 Baush, m.d., 16x30" head.
No. 2 Baush, m.d. tapping attach.
No. 3 Baush, m.d., 20x40" head.
No. 3 Baush, m.d., 16x30" head.
No. 11 Pratt & Whitney, belt.
No. 22AC Fox, 16" round head.
No. 26C Fox Tapper 17x35" head, 50 spindles, 3 spindle Rockford 12" Gang.

BALL BEARING DRILLS

1 spindle Leland & Gifford, p.f.
No. 4BM Fosdick, m.d.
No. 5 Fosdick, m.d.
No. 5M Fosdick, m.d. on spindle.
1 spindle No. 2 Avey.
2 spindle Sigourney.
3 spindle Barr.
4 spindle No. 2 Avey.
4 spindle No. 2 Fosdick, p.f.
4 spindle 13" Fosdick Super Speed.
4 spindle Gardam.
4 spindle Kokomo.
6 spindle Henry & Wright.
7 spindle Barr.

GEAR CUTTERS & HOBBERS

No. 61A Fellows Gear Shapers, m.d. thru gear box.
No. 12 Barber-Colman Double Overarm Gear Hobbers, m.d.
No. 12 Barber-Colman Single Overarm, belt.
Gross Gear Tooth Rounder, m.d.
No. 5M Adams Mfg. Gear Hobber, m.d. in base, 1 year old.
48" Cleveland Gear Hobber, m.d.
18" Gleason Straight Tooth Bevel Gear Generator.
No. 3-26" Cincinnati Spur Gear Cutter.
No. 3-26", 3-36", 3 Heavy, 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Spur Gear Cutters.
30" Brainerd Gear Cutter.
No. 36BM 3 spindle Gould & Eberhardt Gear Rougher.
90" Gould & Eberhardt Gear Cutter.
12" Ingle Gear Tooth Rounder.
Gleason Spiral Bevel Gear Rougher.

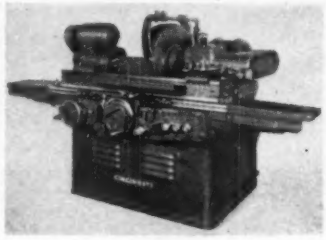
VALVE SEAT GRINDER

Cincinnati Valve Seat Grinder, m.d., with A.C. motors, cap. ⅜" valve stems.

CYLINDER GRINDERS

No. 55, 60, 65 Heald.

CYLINDRICAL GRINDERS



Cincinnati Plain Hydraulic

8x36" Cincinnati Saddle Type, m.d.
10x36" Cincinnati Plain Hydraulic, m.d., latest type, 1 year old.
10x36" Landis Integral Cam, m.d.
10x52" Landis Plain, m.d.
10x52" Landis Plain, m.d.
12x48" Cincinnati Plain Self-contained, 3 motor drive.
10x72" Landis Plain, m.d.
12x36" Cincinnati Plain.
12x36" Modern Plain, m.d.
12x36" Modern Plain, belt.
12x42" Landis Plain, belt.
12x48" Modern Plain, m.d.
16x120" Landis No. 18 Plain, m.d.
26x96" Landis Plain, m.d.
16x40" Landis No. 3 Universal, m.d.
16x72" Cincinnati Universal Self-Contained, m.d.

INTERNAL GRINDERS

No. 70 Heald, equipped with Red Head Spindle.
No. 72 Heald Hydraulic, m.d., arranged for grinding spindles.
No. 6 Bryant, belt.
No. 10 Bryant, belt.
No. 20 Bryant, belt.

SURFACE GRINDERS

No. 1 Fraser Lapper, 26" plate.
Diamond No. 2, m.d. in base, hydraulic feed.
Diamond No. 2, mechanical feed.
14" Pratt & Whitney Vertical, m.d.
Walker Single Stroke, 10" chuck.
38"x38"x12' Gray Planer Type, m.d.
54" Bridgeport Knife, belt.

TOOL & CUTTER GRINDERS

Gisholt Universal, belt.
Gleason Cutter, belt.
Gould & Eberhardt Gear Cutter Grinder, belt.
Landis Chaser, belt.
3" Sellers Drill, belt.

HAMMERS

50 lb. Little Giant, m.d.
60 lb. Bradley Rubber Cushioned Helve.
No. 400 Bliss Board Drop.
600 lb. Niles-Bement-Pond Steam.
800 lb. Bement Single Frame Steam.
1100 lb. Bement Miles Single Frame Steam.
2000 lb. Niles-Bement-Pond Single Frame Steam.
2500 lb. Bement Miles Single Frame Steam.
Pettengell Bumping, belt.

KEYSEATERS

No. 2 Baker, belt.
No. 2 Morton, belt.
No. 4 Mitts & Merrill, belt.
Morton, 1" cap.

ENGINE LATHES

16"x8' Monarch, m.d. in base.
20"x12' Monarch, m.d. in base, taper.
18"x10' Lodge & Parker, cone.
20"x10' Leblond, cone.
16"x6' Hendey Yoke Head, m.d., taper.
18"x8' Hendey Yoke Head, m.d., taper.
20"x8' Hendey Yoke Head, m.d., taper.
20"x10' Hendey Yoke Head, m.d., taper.
14"x8' Sidney, m.d.
19"x8' Leblond, m.d., taper.
16"x6' Reed-Prentice, m.d., taper.
25"x14' LeBlond, m.d.
22"x16' centers (22' bed) American 100 H.P. Input Super Lathe, with 100 H.P. D.C. motor, equipped with p.r.t., chip conveyor, chip breaker, weight of lathe 45,000 lbs.
22"x18' Niles, cone.
24"x15' Prentice Geared Head, m.d.
24"x10' Greaves-Klusman, cone.
27"x16' LeBlond, cone, taper.
30"x14' Lodge & Shipley, m.d.
36"x10' Putnam, cone.
36"x16' Springfield, cone.

MANUFACTURING LATHES

8x72" Lo Swing, m.d.
8x84" Lo Swing, m.d.
3½x36" Lo Swing, s.p.d.
3x80" Lo Swing, s.p.d.
9x12" Sundstrand Mfg.
11"x4' Wells Speed.
14"x6' Champion.
15"x6' Automatic Threading, m.d.
15"x6' Harrington Barrel Turning
20"x16' American Geared Head, arranged for spindle boring.
Niles - Bement - Pond Quartering Machine, m.d., new.
No. 5—42x96" Niles-Bement-Pond Car Wheel Lathe, m.d., new.
42x96" Niles - Bement - Pond Car Wheel Lathe, m.d., used.
Niles-Bement-Pond Axle Lathe, cone.

We have more than 1,000 machines in stock at the present time.

Our facilities are available for

THE EASTERN

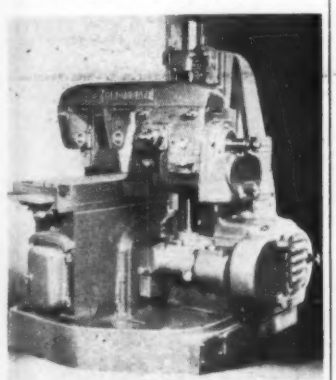
1004 TENNESSEE AVE.,

—No Priority Required

MILLING MACHINES

Cincinnati Plain Hydromatic

No. 4 Cincinnati Universal, cone, motorized.
No. 2 Cincinnati Plain Dial Type, m.d. in base.
No. 4 Cincinnati Plain, rect. overarm, m.d.
No. 5 Cincinnati Plain, rect. overarm, m.d.
No. 3B Milwaukee Plain, double overarm, m.d.
No. 4B Heavy Milwaukee Plain, double overarm, m.d., vert. attach.
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 3 Brown & Sharpe Plain, cone, motorized.
No. 1½ Brown & Sharpe Plain, cone, motorized.
No. 2 Cincinnati Universal, cone, motorized.
No. 3B Milwaukee Universal, double overarm, m.d.
No. 2M Cincinnati Vertical, m.d. in base, p.f. rotary tables, latest type, less than 1 year old (2 in stock).
No. 3 Cincinnati Vertical High Speed Dial Type, m.d. in base, latest type.
No. 3 Cincinnati Vertical, m.d., flanged spindle.
No. 2 Knight Vertical, m.d.
No. 5 Jackson Vertical, m.d.



Cincinnati Plain Automatic

No. 1-18 Cincinnati Plain Automatic, m.d., latest type, less than 1 year old.
No. 2-18 Cincinnati Rise & Fall Automatic, m.d. in base, latest type, 1 year old (2 in stock).
No. 2-24 Cincinnati Plain Automatic, m.d. in base, lafest type, less than 1 year old.
No. 4-48" Cincinnati Plain Hydromatic, m.d. in base, latest type, 1 year old.
18" Cincinnati Mfg., m.d., 1 year old (3 in stock).
4½x12", 12x48" Pratt & Whitney Thread, m.d.
18" Cincinnati Automatic Duplex, m.d. (3).
28" Cincinnati Plain Automatic, belt.
36"x36"x14' Bement Slab, m.d., p.r.t.
No. 2, 12 Pratt & Whitney Lincoln Type.
No. 2 Pratt & Whitney Hand.

PIPE MACHINES

1¼" Landis 2 spindle Pipe & Nipple, cone.
2" Bignall & Keeler, cone.
4" Eaton, Cole & Burnham, belt.
3" Jarecki, belt.
4" Curtis & Curtis, belt.
6" Landis, m.d. thru gear box.
8" Bignall & Keeler, belt.
16" Cox, arr. m.d., 2 heads.

PLANERS

36"x36"x20' Cincinnati, 2 heads, m.d.
24"x24"x5' G. A. Gray, 1 head.
24"x24"x6' G. A. Gray, 1 head.
24"x24"x6' Pond, 1 head.
30"x30"x10' American, 1 head.
30"x30"x10' American, 1 head.
30"x30"x14' G. A. Gray, 2 heads.
36"x36"x10' Cincinnati, m.d., 2 rail, 2 side heads.
36"x36"x10' Niles, 2 heads.
36"x36"x10' Ohio, 1 head.
36"x36"x12' Powell, 2 heads.
42"x42"x26' Gray, m.d., 2 heads.
48"x48"x40' Sellers, reversing m. d., 2 heads.
56"x48"x18' Putnam, reversing m. d., 2 rail, 2 side heads.
60"x60"x20' G. A. Gray, m.d., 2 rail, 2 side heads, box table.
60"x60"x20' Cincinnati, m.d., 2 rail, 2 side heads.
96"x72"x18' Pond, 2 rail heads, 2 side heads.

PRESSES

D2 Ferracute S. A. Drawing.
P2 Ferracute Stiles Type.
No. 6 Waterbury-Farrel D.C.
S51 Ferracute D.C.
No. 54A Toledo Special, m.d.
No. 268¼B Toledo D.C. Toggle Drawing, m.d., 15" stroke of blankholder, weight 175,000 lbs.
No. 496D Toledo D.C. Toggle Drawing, m.d., 11½" stroke of blankholder, weight 160,000 lbs.
30 ton Lourie Hydraulic type BX.
B33 Metalwood Hydro-Pneumatic.
300 ton Niles Horizontal Wheel Press
No. 0 Springfield Bench Type Straightening Press.

PUNCHES & SHEARS

Robinson 1" cap., m.d., 12" throat.
Pexto Lever Punch, 6" throat, hand.
Robinson Lever Punch, 18" throat, hand.
No. 2 Niagara Bench Type, ½" cap., hand.
No. 6 Long & Allstatter S.E., cap. ½" thru ½", belt.
No. 2 Robinson, 1¼" stroke.
Cleveland Type C S.E. cap. 1" thru ½".
Cleveland Model E.F. D.E., 36" throat both ends, belt.

RIVETERS

¼ Shuster, belt.
Hanna Bench Type Air, 8" throat.
Hanna Pedestal Type Air, 13" throat.
⅛" Adt, belt.
Pedrick & Ayer Pneumatic, 6" throat.
Chicago Pneumatic 24" throat, size 10 x 25 x 97.
No. 5A High Speed Hammer, belt

TURRET LATHES AND SCREW MACHINES

No. 2A Warner & Swasey Universal, m.d., bar (2).
No. 2A Warner & Swasey Universal, m.d., chucking (2).
No. 3A Warner & Swasey Universal, m.d., bar (2).
No. 3A Warner & Swasey Universal, m.d., chucking.
No. 6 Warner & Swasey, bar
No. 6 Warner & Swasey, bar, with universal carriage.
No. 3 Cincinnati Acme Full Universal, m.d., chucking (4 in stock).
No. 2L Gisholt, m.d., hardened ways, bar.
No. 2L Gisholt, m.d., hardened ways, chucking.
2¼" Jones & Lamson, m.d., steel head, bar.
1¼" Dreses Hand Screw Machine, chucking.
3 x 36" Jones & Lamson Geared Head Flat Turret, m.d.
2 spindle Jones & Lamson Geared Head, chucking (4).
18" Libby Type A Turret, m.d. (4).
20" x 7' American Turret.
28" Gisholt, cone.
24" Gisholt, cone, 6¼" hole.

SHAPERS

16" Cincinnati, cone, motorized.
16" Gould & Eberhardt, cone.
20" American B.G. Crank, cone, motorized.

SAWS

6 x 6" Peerless Hack.
8 x 8" Atkins Hack.
Klemm 6 x 6" Tilting Metal Cutting Band.
6" Avey Milband Cutting-off Machine, s.p.d.
No. 138 Espen-Lucas Cold Saw.
No. 2B Cochran-Bly Cold
No. 3, 8 Nutter & Barnes Cold.
No. 5, 6 Cochran-Bly Cold.

SHEET METAL MACHINERY

No. 2 Bethlehem Rotary Shear, ¼" cap., 32" throat.
No. 3 Gray Sheet Metal Cutter, 5/16" cap. 36" throat.
No. 34 Lennox Rotary Bevel Shear, cap. ¾".
No. 41 Lennox Shear.
Quickwork Rolling Machine, 20" throat, 18 ga.
Quickwork Circle Shear, 30" throat, 16 ga.
Southwark Rotary Metal Cutter, ⅜" cap., 36" throat.
8' Niagara 18 ga. Foot Power Shear.
8' Robinson Power Brake, 10 ga.
No. 204 Dreis & Krump 10' Power Brake, 10 ga.
No. 22 Williams & White Eye Bender, 1½" cap.
McCabe Pneumatic Flanger, ½" cap.
Niles-Bement-Pond Hand Flanger 8'.
No. 10A Quickwork Double Seamer, belt.
Magee Sheet Metal Wiring & Edging Machine, m.d.

SLOTTERS

15" Niles, m.d.
10" Newton, belt, 20" table.
12" Niles, belt, 26" rotary table.
15" Canada, m.d., 30" table
48" Niles-Bement-Pond Geared, reversing D.C. drive, 50" table.
No. 1 and 3 National Acme Screw Slotters.
No. 1 Garvin Knee Type.
No. 8 Gaterman Oscillating Pneumatic.
½" Rickert & Shaffer Vertical.
No. 5 Webster & Parks 5 spindle Vertical Nut Tapping.

WELDERS

Wilson 250 amp. Arc, driven by Oldsmobile Engine.
General Electric 200 amp. Arc driven by Pontiac Engine.

MISCELLANEOUS

No. 12 Pratt & Whitney 2 spindle Profiler, gear driven spindles.
Detrick & Harvey 2 spindle Profiler, belt driven spindles.
No. 1½A Standard Rotary Swaging Machine, m.d.
Abbott Burnishing Barrel, belt.
Cincinnati Elec. Tool Co. Abrasive Cut-off Machine, 7½ H.P., latest type, less than 1 year old.
Gisholt Precision Balancer, m.d.
4" Hurlburt & Rogers Cut-off.
17x21" Lentz Poppet Valve Steam Engine direct connected to Allis-Chalmers Generator, 200 KVA, 200 RPM, 240 volts, 60 cycles.
Anderson Filing Machine, m.d.
No. 2 Cochran-Bly Filing Machine.
American Ldry. Machinery Co. 48" Oil Extractor, m.d. with motor, type No. 312, 14.4 cu. ft. cap.
No. 11, 11 S Cochran-Bly Saw Sharpeners.
Wagner Saw Sharpener, belt.
No. 1 Leighton Type Straightening Machine.
⅜" F. B. Shuster Wire Straightener.

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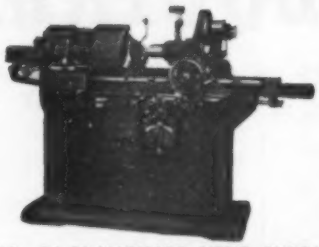


GRINDERS

No. 72 HEALD SIZE-MATIC INTERNAL Hydraulic Feed: B.B. spindle.
No. 52 GREENFIELD HYDROIL INTERNAL (2) Hydraulic Feed; B.B. spindle.
34"x10'x6" FARREL ROLL GRINDER, 30" grinding wheel, M.D.

No. 16 BLANCHARD VERT. SURFACE, 26" chuck, M.D.
No. 10 BLANCHARD VERT. SURFACE, 16" chuck, M.D.
15"x15"x96" NORTON; No. 2 W&M, M.D., Mag. chuck.
CYLINDRICAL: 14"x72" NORTON; 10"x36" LANDIS.
DISC: No. 24 GARDNER VERT. SPINDLE HORIZ. 53" DISC. B.B.

PLANERS

60"x14 FT. BETTS, 2 heads on rail, 1 side head.
60"x42"x12' FT. ROCKFORD, 2 heads on rail, 1 side head.
60"x18' NILES, M.D.
44"x36"x8 FT. GRAY, 2 heads on rail.
36"x12 FT. GRAY, 2 heads on rail.

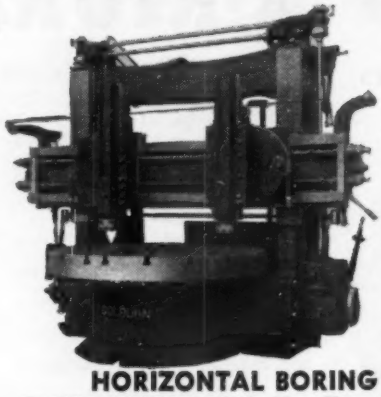
OPENSIDE

42"x45"x15' LINCOLN.
42"x42"x14' PATCH; 42"x40"x13' PATCH;
42"x36"x14' NEW ALBANY; 42"x45"x15' BEDFORD.

TURRET LATHES

No. 3-A WARNER SWASEY UNIVERSAL, 3⅜" hole.
28" NILES BEMENT POND; 4½" hole in spindle.
No. 16 GISHOLT SIMPLIMATICS, 21" swing.

5" NATIONAL UPSETTER, Steel Bed, B. G.



VERTICAL BORING MILLS

10 FT. POND, 2 swivel heads on rail, M.D.
62" & 72" COLBURN, 2 heads on rail, Geared feeds, Rapid traverse, M.D.
51" BULLARD, 2 heads on rail.
48" ROCKFORD, 3 spindle, M.D.
6" BULLARD MULT-AU-MATIC, 4 stations.

HORIZONTAL BORING MACHINES

8" NILES BEMENT POND, Floor Type, Extra High Column.
3" bar MORRIS, AC M.D., Table 20"x36".
4" bar KEMPSMITH, M.D., Table 42"x60".

MILLING MACHINES

PLAIN: No. 3 RYERSON CONRADSON; No. 2 CINCINNATI.
No. 2-B KEARNEY TRECKER, DBLE. OVERARM.
VERTICAL: No. 2½-B KEARNEY TRECKER, S.P.D.
UNIVERSAL: No. 2 BROWN & SHARPE.
No. 1 KEMPSMITH; No. 1½ HENDEY NORTON, M.D.
PRODUCTION: 18" CINCINNATI, 24" CINCINNATI, M.D.
10" P&W SEMI-AUTO. 2" P&W DUPLEX SPLINE MILL.

FLOOR LATHES

30' PIT LATHE, 156" face plate; 24"x15' NEW HAVEN.
22"x12' LODGE & SHIPLEY; NEW 14"x6' ROBBINS, GD. HD.

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OTT MACHINERY SPECIALS

AUTOMATICS, Brown & Sharpe #00G
AUTOMATICS, Gridley, 2¼, 3¼ & 5¼" SS.
AUTOMATICS, Cleveland, 1½, 2¾ & 3¾" Mod. A
AUTOMATICS, Cleveland, ⅞, 1¼, 2 & 2½" Mod. B
AUTOMATICS, Gridley, ¾" Model F, M.D.
AUTOMATICS, Cleveland, ⅝" 4 spdle, cut-off, M.D.
AUTOMATICS, Potter & Johnston #5A & 6A
BORING MILLS, 42" Gisholt, 1 Turret & S.H.
GEAR HOBBERS, 12 Barber-Colman M.D.
GEAR SHAPERS, #7 High Speed, M.D.
GRINDERS, Blanchard #16A, M.D. 30" Mag. Chuck Dial loading
GRINDERS, Heald B. S. 12" Mag. Chuck #255
GRINDERS, Landis, #1 Universal
GRINDERS, Norton, 14x36" Plain, M.D.
LATHE, Steinle Turret, 24" with 4" & 6¼" Hole through Spindle
MILLING MACHINE, #8 Becker Duplex, M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLER & DRILLER, Knight #2
PLANERS, 54" x 42" x 16' Gray, 4 heads
PLANERS, 42 x 42" x 12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo, #5 Open Back Inclinable

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PROMPT DELIVERY ON MOST TOOLS

Automatic, 1⅝" No. 55 National Acme M.D.
Automatic, No. 16 Gisholt Simplimatics
Chuckers, 4½" Gridley Model H, 4 spindle
Chuckers, 7" Baird 6 spindle
Cylinder borer, 3⅞" bar Beaman & Smith, horizontal
Brake, 10' Ohl 8" crank, 255 ton cap'y press brake
Broaches, Nos. 3 & 4 J. N. LaPointe
Compressor, 550 cu. ft. National 3 cylinder vertical
Compressor, 1400 cu. ft. Sullivan WN3
Drill, 30" Rich Tool Co., heavy duty
Drill, 20" Barnes A.G.S.O.
Drill, No. S 201 Barnes production
Drill, No. 16 Nateo multi, 24 spdl.
Drill, Type 8H Nateo horizontal
Drill, W. F. & J. Barnes vertical boring, reaming & drilling, hyd. feed
Drill, Rehnberg-Jacobsen, 16 spdl. production
Gear shaper, Z1 (No. 81) Fellows
Gear shaper, Z2 (No. 624) Fellows
Gear hobber, No. 16 HS Gould & Eberhardt
Grinder, No. 3 Cincinnati universal
Grinder, No. 84 Gardner, 24" opposed spindle
Grinder, Landis 10" x 48", 12" x 36", 16" x 52"
Grinder, Landis 16" x 32" & 16" x 48" crankpin
Grinder, 20" x 50" Safety Emery Wheel surface
Hammer, 50 lb. Bradley upright
Keyseater, No. 4 Mitts & Merrill
Lathe, 36" x 16' Putnam heavy geared Bod.
Lathe, 24" x 16' Schumacher & Boye
Lathes, 22" 26" Libby turret, M.D.
Lathe, 4" x 36" Lo Swing, hardened ways.
Lathe, 8" Sundstrand Stub
Lathe, 14" x 19" Fay automatic
Miller, No. 2½ Rockford
Miller, No. 4 Cincinnati
Miller, Type C Hall Planetary thread
Miller, No. 3 Turn Millers
Miller, Nos. 10 & 45 Productomatic
Planer, 29" x 29" x 6' 3" New Haven
Planer, 24" x 24" x 6' Woodward & Powell
Press, No. PA3 Farracute horning
Press, No. 8-7 Zeh & Hahnemann str. side
Press, No. 33 Toledo arch
Presses, Nos. 180 & 796¼ D Toledo, toggle drawing
Presses, Nos. 201 & 203 General Flexible
Punch, ⅝" x ⅝" x 26" throat Rock River
Riveters, Nos. 2A hy., 5½ B & 7B High Speed
Rolls, No. 1A Ajax taper forging
Rolls, No. R60 Yoder fender crown
Roll, Waterbury Farrel thread roller
Saw, 36" Newton cold
Saws, Nos. 12, 14 & 17 Higley cold 4" to 8" capy.
Shaper, 24" Gould & Eberhardt
Shaper, 36" Morton draw-cut
Shears, 8" x 8" x 1" Long & Allstatter angle
Shears, 2" capy. Newbold guillotine
Slotter, 4" Garvin
Swager, No. 6 HS Langelier
Tapper, No. 2X Garvin
Tapper, 1" & 1½" National
Threader, ¾" Economy automatic stud
Threader, 2" Landis bolt 2 spdl.
Upsetter, 4" Ajax
Welder, 150 KVA Swift, flash or butt

MISCELLANEOUS

Casing coiler, ⅝" No. 319 Sleeper & Hartley
Spring coiler, No. 5, ⅝" capy. Sleeper & Hartley
Hone, No. 211 Barnes
Lathe, Meiling 6 cyl. crankshaft
Sand Mixer, Baker Perkins
Screw Driver, No. 61AA Bodine
Washer, Blakeslee metal
Wire machine, ⅝" x 3' Shuster
Threader, 1" Cleveland automatic double end
Gear checker, National Tool, for gears & cutters
Grinder, Cincinnati face milling cutter
Buffer, Hawes No. 575 for polishing
Die Casting Machine, A. C. Spark
Screw driver, Model C Detroit
Tester, 60,000 lb. Tinius Olsen drop
Washer, Blakeslee, conveyor type

If you do not find the machine you need listed herein, mail us your inquiry and specifications. We may have or know of that very machine

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MILES MACHINERY CO., SAGINAW, MICH.

BORING MILL, 42" **BULLARD** Rapid Production, 1 turret head, 1 swivel head, motor drive.
GEAR PLANERS, Bevel 36" & 54" **GLEASON**.
PRESS, Double Crank 95-B **TOLEDO**, bed area 55" x 54", tie-rod, stroke 3", motor drive, M.D.
PRESS, Hydraulic 1000 ton **WOOD** Platen 42" x 9', stroke 18", daylight 36", motor drive.
PRESS, Toggle No. 14 **BLISS**, bed area 48" x 52", tie-rod, stroke 26", motor drive.
TURRET LATHE, 3-A Warner & Swasey Universal Hollow Hexagon Geared Head, H.S. 3 11/16", S.P.D.
TURRET LATHE, 26" **LIBBY** "C" Geared Head, H.S. 7⅜", S.P.D.
TURRET LATHE, 34" **GISHOLT** "K", H.S. 4¾", M.D.

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5' **Radial Drill, Bickford**, M.D.
26" x 14' **Bridgeford Geared** ead Lathe.
#14 **Cochrane-Bly Vert. Miller & Shaper**, M.D.
50" **G & E Gear Cutter.**
24" **Gisholt Turret Lathe**, 6¼".
20"-24"-32" **Shapers.**
10' **Bridgeport Knife Grinder.**
36" **Morton Draw Cut Shaper.**
No. 2 **Baker Keyseater** 2" x 20".

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Every machine listed in this column is in our warehouse at press time.

●

76" BULLARD Vertical Boring Mill, 2 swivel heads, M.D.

4⅝" Bar N.B.P. Horizontal Boring Mill, Knee Type, 30"x90" table, M.D.

42" PUTNAM Double End Car Wheel Lathe, M.D.

47" N.B.P. Double End Car Wheel Lathe, M.D.

No. I L & A Multiple Punch, 100 tons, 72" between housings

6" x 6" x ⅝" Double Angle Shear.

Beam Shear 20", 60# and smaller.

60" Throat 8" x 1 1/16 Shear.

54" Throat 1¾" x 1⅛" Punch.

3¼" x 12" TRIPLEX Pumps, 1500 to 2000 lb. pressure, 60 to 70 GPM.

15" GLEASON Bevel Gear Generator.

30" x 30" x 10' NEWTON Slab Miller horizontal arbor, M.D.

36" Rotary Planer, M.D.

52" Rotary Planer, M.D.

48" x 48" x 24' NBP Heavy Planer, Two Rail, One Side Head, Motor Drive.

48" x 48" x 20' PATCH Planer, 4 heads, 230 Volt D.C. Rev. Motor Drive.

24" NEWTON Cold Saw, 7½" capacity, M.D.

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AUTOMATICS

⅞" Gridley Model G, four spindle
1¼" Gridley Model F, four spindle
1¾" Girdley Model F, four spindle
9/16" National Acme, No. 515, four spindle
2½" Cleveland, Model A, single spindle

BROACHES

HO American Hydraulic, Horizontal
XB10 Oilgear Hydraulic, Horizontal

DRILLS

Barnes Camelback, single spindle, tapping
No. 17 Foote Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping

GEAR CUTTERS

No. 6 Fellows Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

22" x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
14" x 50" Norton Cylindrical
10" x 72" Brown & Sharpe Cylindrical
No. 1 Cincinnati Tool & Cutter
No. 70 Heald Internal

LATHES

14" x 6' Lodge & Shipley, c.d.
16" x 8' Hendey, c.d., yoke head
18" x 8' Lodge & Shipley, c.d.
8" x 60" Fitchburg Lo-Swing, q.h.
No. 12 LeBlond Multicut, q.h.

TURRET LATHES

36" Bullard New Era V.T.L., m.d.
No. 2 Acme Full Universal, q.h.
No. 2A Warner & Swasey, q.h.
18" Steinle, q.h.

MILLS

3" Lucas Horizontal Boring, m.d.
No. 1½A Brown & Sharpe Universal, s.p.d.
No. 2 Cincinnati Plain, s.p.d.
No. 3 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
Type A Briggs, c.d.
No. 6 Whitney Hand, c.d.
No. 3 Knight Vertical, s.p.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS

Cochrane-Bly Die Filing Machine
10' x 16 Ga. Ohl Squaring Shear
No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.

PLANERS & SHAPERS

16" Gould & Eberhardt Crank Shaper, c.d.
20" Stockbridge Crank Shaper, c.d.
24" x 24" x 8' Cincinnati Planer, m.d.
24" x 24" x 8' American Planer, m.d.
38" x 38" x 12' Niles Planer, m.d.

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INGERSOLL 24" Cutter Grinder
LANDIS No. 3½ Int. Hyd. Race Grinder
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LANDIS 20"x220" Plain Grinder — Motor driven

NATCO C-13 Hyd. Multiple Spindle Drill
ESPEN LUCAS No. 138 Cold Saw —Cap. 12"
ACME 1" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
LONG & ALSTATTER Angle Shears
AMERICAN 30"x30"x14' Planer 2 heads, M.D.
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Vertical-Slotting—Rack Cutting
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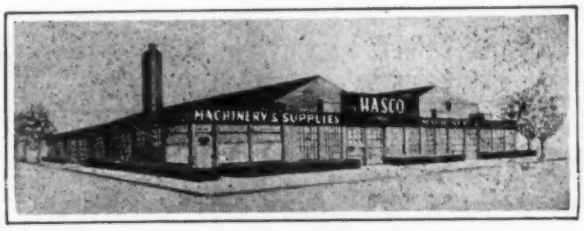

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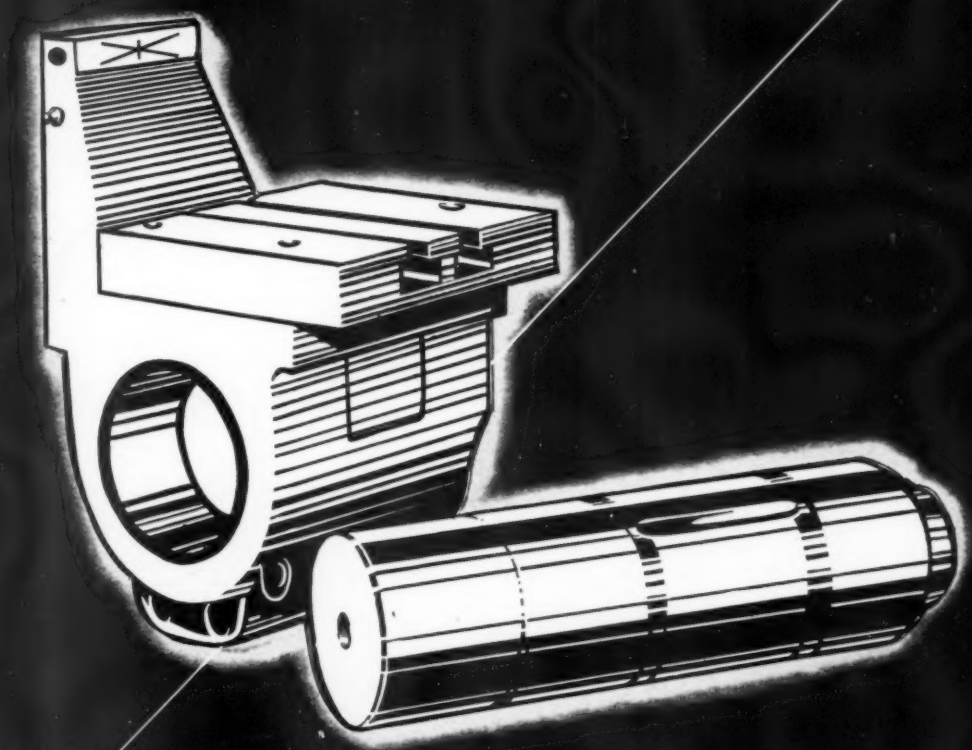
Symbol of Stamina

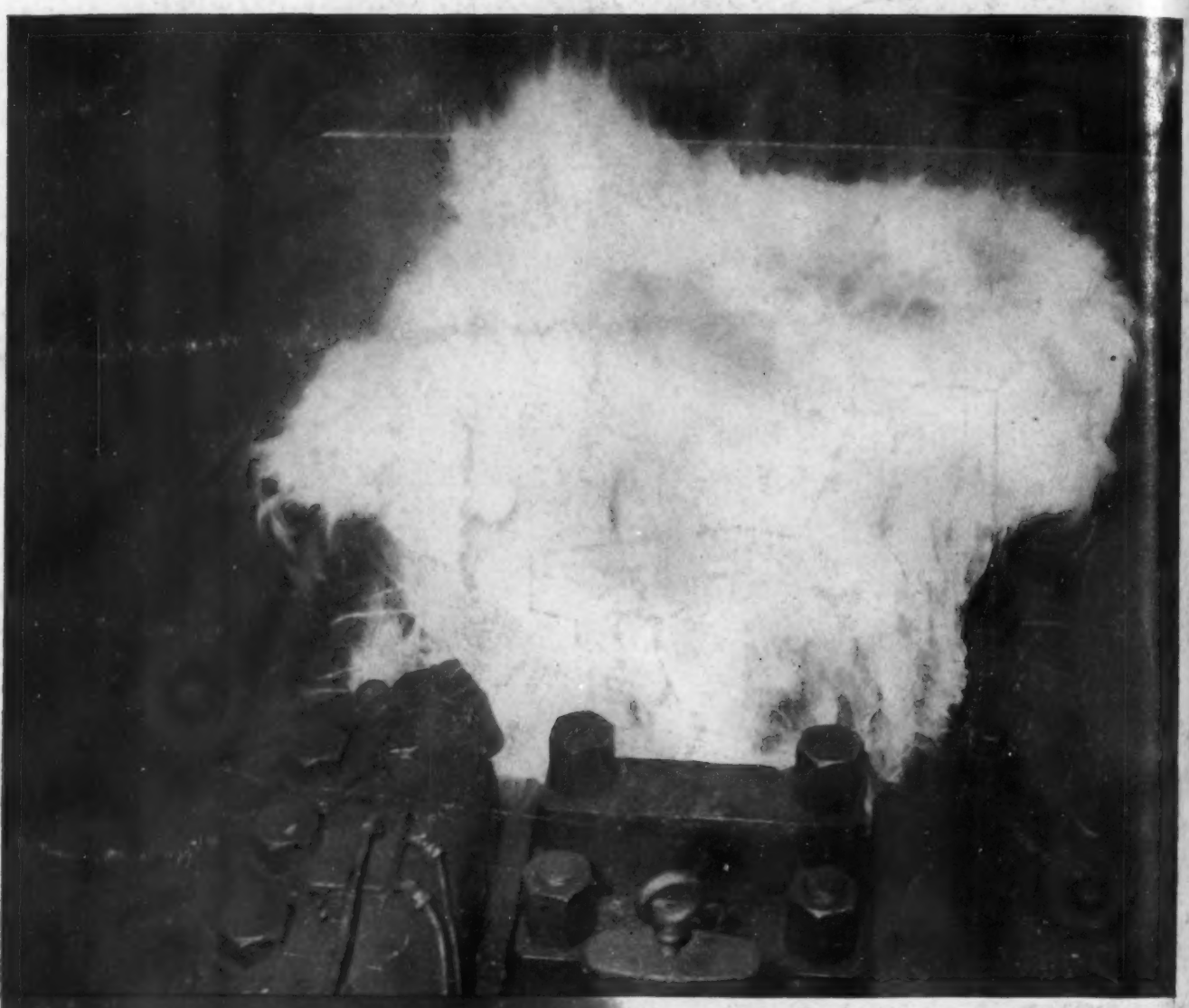


The extra stamina and performance of the New Britain Automatics is the product of painstaking and skillful engineering of every component part • In a New Britain Screw Machine, this is well illustrated by cross slide construction. All forming slides are mounted on large diameter hardened and especially smooth finish alloy steel studs rigidly supported on each end, practically eliminating wear. Slides are fitted with hardened and ground tool holder bases in which tool locating slots are accurately ground to size. The entire assembly is designed to eliminate wear and vibration and facilitate set up.

NEW BRITAIN-GRIDLEY MACHINE DIVISION · THE NEW BRITAIN MACHINE COMPANY · NEW BRITAIN, CONN.

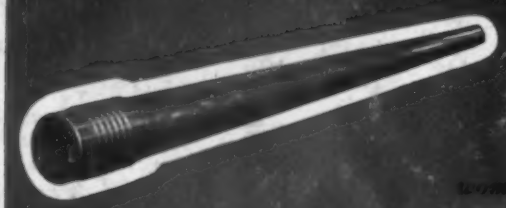
NEW BRITAIN
AUTOMATICS

GET MORE DONE IN WAR OR PEACE



THE FIVE SECONDS THAT SAVE HALF AN HOUR

Timken makes heavy gun tubes from Seamless Steel Tubing



Time was already of the essence . . .

Solemnly, we had promised to become the "arsenal of democracy" . . . to arm our friends against our mortal enemies.

And we had to HURRY, HURRY.

But now the Japanese had poured their fury upon Pearl Harbor and it was no longer a matter of "cash and carry" or lend-lease or frontiers on the Rhine. American men and women and materials had to DO *more and do it faster, better, than it had ever been done before.*

American lives — AMERICA'S LIFE — *depended on it.*

The sheet of flame in the above picture is but one step in a secret process developed by The Timken Roller Bearing Company by which heavy gun tubes are made from Timken Seamless Steel Tubing—at almost incredible savings of time and steel. The breech end of a 75 mm gun tube is being forged in five seconds . . . an operation that once required half an hour of vital time, made much scrap of scarce alloy steel.

The flame is one that leaps up many thousand times a month, one that will continue to leap up as often as the need may be, until the war is won. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

SEAMLESS STEEL TUBES